GHT, JANUARY 6, 1938 FIRST AERO WEEKLY IN THE WORLD REGD. AT THE G.P.O. AS A NEWSPAPER

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The AIRCRAFT ENGINEER AND AIRSHIPS

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FIRST AERONAUTICAL WEEKLY IN THE WORLD : FOUNDED 1909

Editor C. M. POULSEN

Managing Editor G. GEOFFREY SMITH

Chief Photographer JOHN YOXALL

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The Outlook

Resolutions

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If one turns from military to civil aviation, there is good cause to be alarmed. We publish in this issue an article in which an American correspondent lifts the veil and reveals an activity on the other side of the Atlantic which makes our own efforts look lethargic. And last week Capt. Wilcockson, Imperial Airways' well-known pilot, expressed the view that in the matter of training of personnel, operating experience and instrument development and use, this country is three years behind the United States. Taken together, the two give one something to think about.

Losing a Lead

FROM the point of view of technical progress, military and civil aviation cannot be altogether segregated, developments in one field having their immediate repercussions in the other, although possibly with modifications and adaptations. It is now a good many years ago that Great Britain established a lead in flying-boat design and construction. That lead appears to be in very great danger of being lost not because of inability among our designing staffs to produce the world's best, but through lack of support. Until Imperial Airways placed the order for 28 Empire flying boats with Short Brothers, no British firm had had any great encouragement to develop civil flying boats. The Air Ministry ordered a few boats at a time, but could not seem to make up its mind about what it wanted, and changes in policy occurred which did not help towards continuity of effort.

Without regarding as other than ambitious projects which may or may not be built some day, the two American designs for a 550-ft.-span flying boat and a 500-passenger one, there is sufficient actual planning, building and testing going on in America to show how much in earnest are our cousins on the other side. Glenn Martin is developing a 100-passenger boat of 188 ft. span, intended for transoceanic commercial work; his firm has already built and flown the 157-ft.-span boat for Russia described and illustrated in *Flight* recently. Martin, Boeing and Sikorsky are building 60-tonners for the U.S. Navy, and Sikorsky is reported, in addition, to be developing a 50-tonner for the Atlantic service which will carry 36 passengers when operating Atlantic ranges.

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Although it is known that Shorts have on the drawing board an improved version of the Empire boat, and although there are rumours of a very large machine, one cannot quite feel that encouragement sufficient to enable one firm to cope with the competition from three or four American companies is being given British firms.

Experience

IN the meantime, as Capt. Wilcockson pointed out, the Americans have been steadily accumulating experience in long-range transoceanic flying-boat operation. Although weather conditions over the Pacific are very different from those over the Atlantic, the operation of the Pacific route has enabled Pan-American Airways to train their crews in long-distance navigation, and when the Americans come to operate an Atlantic service, they will start with a very great advantage compared with us. Navigational equipment also has been greatly developed and thoroughly tested in actual operational conditions, compared with which the very limited, although very promising, experience which Imperial Airways had an opportunity to accumulate during ten crossings of the Atlantic is insignificant. Operation of the Empire routes will help to fill the gap, but is not strictly applicable to Atlantic conditions.

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Pressure Cabins

YET another direction in which we in this country have failed to progress as we should have done is in the matter of airtight cabins. It is still open to a certain amount of doubt whether or not so-called "stratosphere" flying is likely to be worth while. But quite apart from that, the time may very well come, and quite soon, when passengers in commercial aircraft will demand to be protected against the painful effects of fairly rapid changes of altitude. Already on the American sleeper service from Atlantic to Pacific coasts passengers are complaining that they wake up in their berths with pains in the ears. Of little use to provide luxurious sleeping accommodation and to exclude all noise from the cabin if eardrums are going to be distressed by changes in pressure. Thus the airtight cabin in which a constant pressure is maintained may be forced upon us long before stratosphere flying comes to be generally adopted.

Diesel Engines

WITH the introduction of 100-octane fuels, the diesel aero engine is probably of very limited use for a military aircraft, being applicable to long-range bombers only; but this type of power unit undoubtedly has its application in civil aviation, and other countries, notably Germany, are paying a great deal of attention to its development. In this country we have allowed ourselves to drift away from the diesel, owing to lack of Government support, though shortly a British civil aircraft will take the air with four Jumo diesels to let our people get some experience.

It may be argued that this is cheaper than to finance a sustained effort of our own, but it is always the case that the man who copies is one jump behind the man who originates, and one of these days we shall wake up to find that Germany has evolved a diesel aero engine which, on a fuel much cheaper than petrol, does nearly all that the petrol engine does and for very little more weight. (The pressures reached in the modern petrol engine are getting very high.) It is not a matter which individual enterprise can tackle, and it is for the Air Ministry to see that diesel work is resumed and energetically pursued.

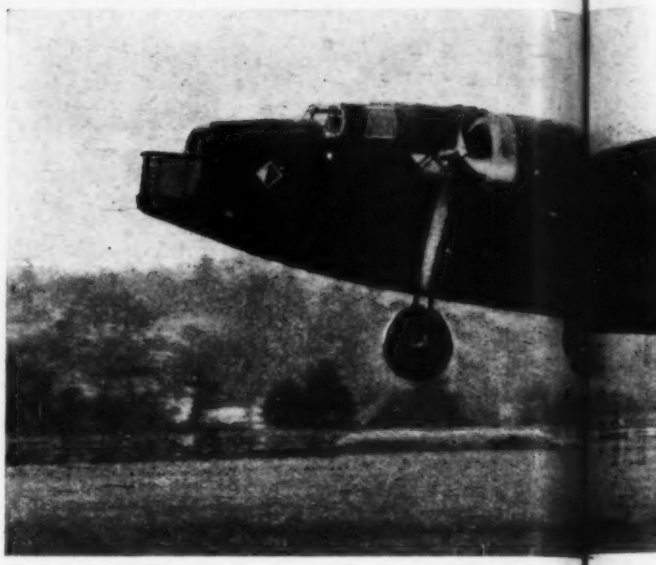
Marshals All

IN the commissioned ranks of the R.A.F. the expansion scheme has resulted in the apparent disappearance (if this contradictory expression may be permitted) of flight lieutenants and flying officers, and in the multiplication of pilot officers and air vice-marshals.

Excluding the Royal Dukes and unemployed marshals of the Royal Air Force, the *Air Force List* of January, 1934, showed fifteen officers of the rank of air vice-marshal and upwards. In those days a marshal, whether vice, simple or chief, was a rarity, and, as such, to be gazed upon with awe.

The half-yearly promotions dated last Saturday are headed by four new air vice-marshals, which brings the marshaled ranks up to a total of thirty. No doubt they are all needed to deal with the great numbers of officers, men and machines now pouring into the Force. One notices, too, that selection for promotion and not mere seniority is now, as always, a very active principle in the Air Force. The four new dignitaries ranked ninth, tenth, eleventh and thirteenth in the list of air commodores, and, therefore, must be officially considered very able officers. They are to be congratulated on their selection, and we are sure that the nine air commodores who probably hoped for promotion on New Year's Day will be the first to offer their congratulations.

To be a *rara avis* confers a dignity, while to be one of a mob of grandees must necessarily dash some of the splendour. Air vice-marshals have not yet descended to the position of silver in the days of King Solomon, which "was nothing accounted of," nor have we yet attained that Utopia whereof Gilbert wrote that "when everyone is somebody, then no one's anybody." Air marshals of all degrees can console themselves by the reflection that they are not yet quite so numerous as are flight lieutenants.



DUCAL DIGNITY: The first production-type Vickers Wellington I... built ... Pegasus XVII radials with two-speed blowers. The transparency of ... turret ... fine lines of the fuselage which, incidentally, ... revised sin...

Bombing the Bomber

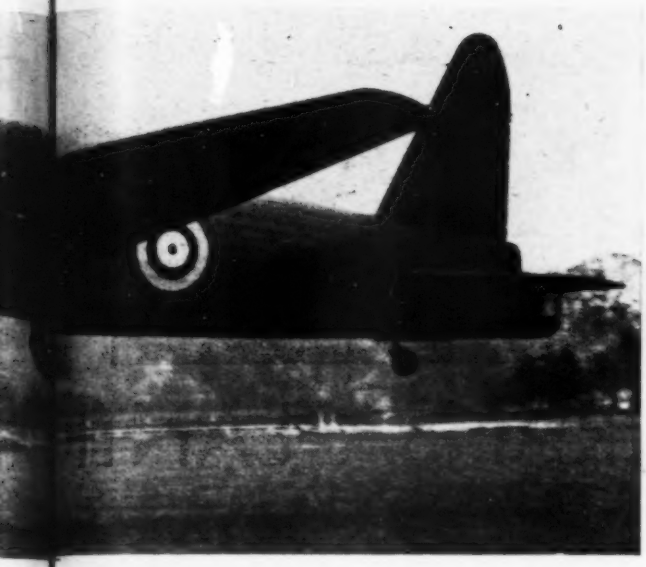
MR. MACLANACHAN, the author of *Fighter Pilot*, makes an interesting though not entirely novel suggestion in the article published on page 19. In the event of another war, one of our greatest problems will be to inflict casualties on enemy bombers which come over to raid our cities. By day a bomber formation with its crossfire of machine-guns is a tough nut to crack, though if the formation can be broken up our fighters can be trusted to deal adequately with the individual enemy machines. Anti-aircraft guns may disturb the formation, but Mr. MacLanachan suggests that an even better way to bring this about would be to bomb the enemy from above. A direct hit would not be necessary (though, of course, desirable); a burst within a hundred yards would, he says, be enough to make the stoutest bomber pilot swerve from his course.

Practical Points

THIS plan depends upon the use of time fuses in the bombs, and in fairly accurate estimation by the defending pilots of their height above the bombers. After a few sighting shots the defenders ought to be able to get the range right and alter their altitude accordingly. But it must be remembered that the greater the height from which the bombing is made, the greater the difficulty of ensuring accuracy. Mr. MacLanachan suggests (though not with any certainty) that 1,000ft. would be a useful height, and one that would keep the defenders outside the effective range of the raiders' machine-guns. But if the bombers carried "cannons," the effective range might well be as much as 1,000ft., and the defenders, who would have to fly on a level course, might suffer casualties, too. It would be impossible to foretell which side would suffer most.

In all fighting risks must be run, and all the defending pilots will cheerfully face risks in the defence of their homeland. The object must be to inflict casualties which will be deterrent while not suffering any crippling losses oneself. If time-fused bombs help our fighters to destroy the raiders, this form of attack will be worth while; provided only that it did not cost us so many Blenheims

DIARY OF FORTHCOMING EVENTS—PAGE 8.



...r built on the geodetic principle and powered with two Bristol ...ncy of the tail turret roofs in this view gives a false impression of marring the ...dentally revised since the prototype appeared.

as to hamper our own power of scotching the wasps in their nests.

This suggested use of Blenheims as aids to the defensive fighters recalls Gen. Golovine's suggestion of a class to be called "destroyers," namely, long-range fighters seating a crew of at least two, which could be used for various purposes as required. Primarily, their task would be to engage hostile bombers at a distance from our shores, leaving it to the single-seater fighters to deal with them when they, or the survivors among them, got near their target. One school of thought in America is also turning towards that class of machine. General Golovine also advises the use of bombs from the air to attack raiding bombers, but he advocates the use of a mortar to fire them.

It might prove very instructive to try out various sorts of air bombs on a Queen Bee or a Queen Wasp, though the moral effect of a near burst could not be judged.

Exchange or . . . . ?

RECENTLY it was announced that, as a result of the visit of the French Air Minister, M. Pierre Cot, to this country, it had been arranged that an exchange of technical information between the French and British Air Ministries should take place.

Last week *Flight* expressed itself unimpressed by that announcement. We based our attitude chiefly on the belief that such exchanges of technical information are already taking place, unofficially, perhaps, but taking place, nevertheless. We had at the back of our mind also the uneasy feeling that although "exchange is no robbery," as the saying goes, it can come perilously close to being robbery when the exchange is 90 per cent. in one direction.

Through political wangles, which are no concern of ours except in so far as they have affected our good friends the French aircraft constructors, France has allowed herself to drift into a position of inferiority in the air, in spite of the unsupported assertions to the contrary of the champions of her present policy. Some of her most brilliant designers have been fettered, and some of her pioneer constructors, such as the Farman brothers, have refused to be a party to the present muddle and have retired from business. Such happenings must be very much our affair while we are as closely in sympathy with France as we are at present.

Bearing all these things in mind, it is curious, to say the least, to learn from the French Air Minister, in the Chamber, that France has decided to purchase some 50 or 60 American aero engines to be installed in her prototype aircraft, and the licence to build these engines in quantity in the French nationalised factories.

Whether or not French engines are so inferior that something drastic must be done is not for us to decide. But it might have been thought that if France is going abroad for aero engines she would have come to Great Britain. In arranging with M. Pierre Cot to exchange technical information, that was surely one of the things Viscount Swinton might have insisted upon to help in evening-up the exchange.

Wanted—an Explanation

WHEN the announcement was made late in November of last year that an expansion of the Accidents Branch of the Air Ministry was to take place, there were many who hoped that this would result, among other things, in a speeding-up of the issue of official "findings." This hope seems to have been a vain one. It is now five weeks since the mishap to the flying boat *Cygnus* occurred off Brindisi, and it might have been expected that the world would by now have been told what, in the opinion of the investigators, caused the accident in which two lives were lost.

In a large percentage of accidents there is some excuse for delay in arriving at conclusions. The machine may have been totally destroyed and no member of the crew may have survived from whom information could be obtained. Very fortunately, such was not the case in the *Cygnus* accident, and the pilot himself has been able to give his account of what occurred. Thus, it is extremely difficult to see any valid reason for the delay in issuing any kind of explanatory statement.

In the early days of civil aviation it became the custom, a sort of unwritten law, not to publish the results of accidents investigations, at least not until they were given, vaguely and unconvincingly, in the next annual report on the Progress of Civil Aviation. Doubtless we shall be told of the cause of the *Cygnus* accident in the next annual report, but that will, in all probability, not be published until some time in 1939.

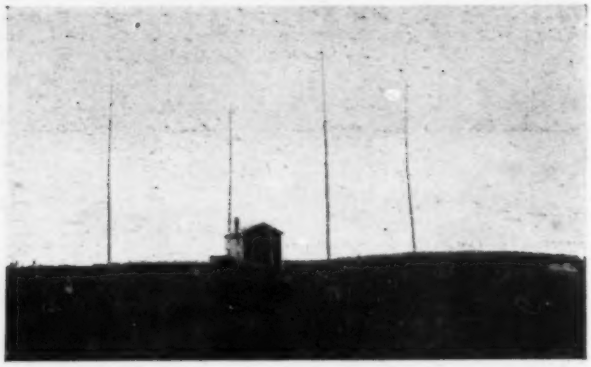
In the early days there was some excuse for suppressing the results of accidents investigations. Engines in those days were very unreliable, and forced landings were of frequent occurrence and led to many mishaps. Nowadays, however, engine failure is hardly ever responsible for an accident, and in the interests of the constructors, no less than of the travelling public, it is desirable that the full facts should be made known, and that without delay.

The Airports Exhibition

THE Aerodrome Owners' Association has decided not to hold an airports exhibition this year in connection with the Airports Conference to be held on January 19, 20 and 21. It was felt that in a twelvemonth the changes in airport equipment are not very great, so that if the exhibition were to be held annually, many of the exhibits would of necessity already be familiar to visitors.

Probably there is much to be said for this point of view, but it would appear that by throwing the exhibition open to the general public a good deal of interest would be created and at least some portion of the expense of showing might be recovered.

As an alternative, it might be possible to have such an exhibition every year, but to hold it in London every other year only, selecting provincial cities for the alternative years. It is even possible that an improvement might be effected by holding the exhibition at an actual aerodrome instead of in a town. Much of the aerodrome equipment could then be shown actually working, and those interested would have a better opportunity to judge for themselves the relative merits of competing products. It is understood that certain members of the Aerodrome Owners' Association are in favour of such a course, and certainly any scheme of this kind merits the very closest examination.



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The Work of the Weather Bureau in lland
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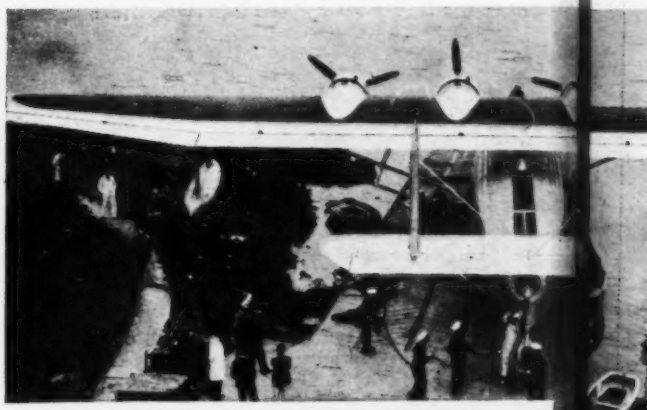


As the quarters at Botwood are only temporary it might be expected that they would be somewhat cramped. Actually seven people are normally working in the meteorological office shown above. On the right are the radio receiving hut and masts.

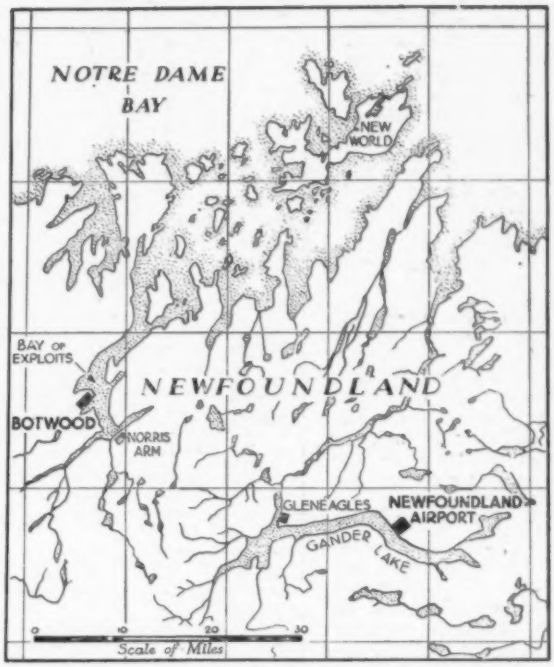
ALTHOUGH the experimental transatlantic flights of the flying boats *Caledonia, Cambria* and *Clipper III* have already been described in some detail, the amount of work done by the twenty-two men at the western sea base at Botwood, Newfoundland, has not, so far, been fully realised. In this article the general organisation of the station will be described with the work of six of the twenty-two men. These six devoted their time to supplying meteorological information for the flights and constituted the staff of the Botwood office of the Meteorological Service of Canada.

The accompanying map shows the relative positions of Botwood, Gander Lake (with the emergency landing area at Gleneagles), and the Newfoundland Airport, the construction of which has been progressing steadily. The latter played no part in the flights this summer, though meteorological data were being collected there continuously for future reference.

The emergency base at Gleneagles consisted of a staff house of considerable beauty, built to accommodate the crews of any of the flying boats which were forced to land there, an emergency wireless station and suitable mooring buoys. The permanent staff consisted of a meteorological observer, stationed there to supply landing reports and to collect data for research purposes, and an operator in charge of the emergency wireless station. Only one landing was made at Gleneagles last summer and that by *Cambria* for test purposes.

Botwood is a small straggling village on the west shore of the Bay of Exploits. At the northern end of the village is the sea base. The Bay there is almost entirely landlocked and some two miles wide at its narrowest point. The surrounding land rises slowly from sea level to a height of two to three hundred feet, while a small island (Killick) just off the shore gives splendid shelter for the

The position of the temporary base at Botwood in relation to that of the airport which is now in process of construction beside Gander Lake. This will probably be used as the flying-boat terminal, and the organisation will be centralised.



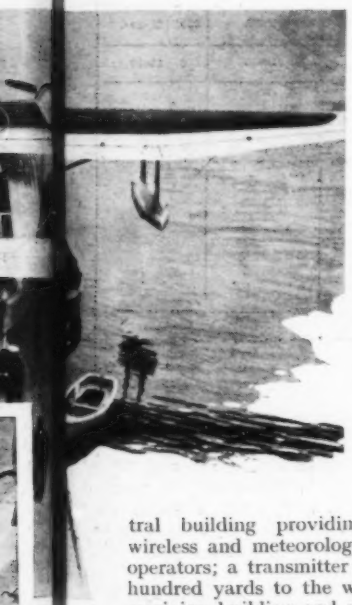
mooring buoys and the refuelling barge. The result is an alighting area which is very nearly perfect. On the mainland, facing Killick Island and about one hundred yards from the water's edge, is the staff house. Originally the staff house was intended to include the control office, a wireless office and the meteorological office, as well as accommodation for the crews of the flying boats. But the plans failed to materialise, as subsequent arrangements meant that all services will eventually be transferred to the Newfoundland Airport, and the beautiful building that had been visualised degenerated into a rough frame structure which served only as living quarters.

In spite of its external appearance, life within was

TIMETEOROLOGY

in Newfoundland During Last Season's Atlantic modifications : Forecasting Accuracy

MAGGART COWAN



Two of the boats which made history last year—*Caledonia* and *Clipper III*—being hauled on to the slipway at Hythe (left). The former was commanded by Capt. Wilcockson and the latter by Capt. Gray on all the Atlantic trips.

reasonably comfortable. The permanent residents of the "Folly," as, for some obscure reason, it came to be called, were the three meteorological officers. These numbers were swelled from time to time by visiting officials and the crews of the flying boats. The wireless station is on the flat top of the ridge behind the village and about one hundred and sixty feet above sea level. It consists of a central building providing office space for control, wireless and meteorology, and living quarters for the operators; a transmitter building and masts some five hundred yards to the west of the central building; a receiving building and masts an equal distance to the east; and a short-wave D/F station a similar distance to the north.

As already mentioned, the original plan was to have the meteorological office in the Folly. When this was not forthcoming a small shop, situated about a quarter of a mile along the coast from the sea base, was rented for the purpose. Its internal dimensions were a bare ten by twelve feet, so that congestion was acute. This could have endured, but in the first week of operation the arrangement was found to be impractical, as the means of communication between the wireless receiving building and the meteorological office was limited to a boy and a bicycle. The boy was willing but the bicycle slow and the distance two and a half miles. There was only one solution to this problem—a wing was added to the central wireless building, and there the maps were plotted and the forecasts issued for the first flight. This wing, having a floor space of only ten by fifteen feet, was found to be inadequate. Besides the six on the meteorological staff, it had to hold two or three operators, and with the temperature in the eighties and nineties the result was conducive neither to harmony nor efficiency. Another wing of similar size was added, and that completed the construction of the present meteorological office.

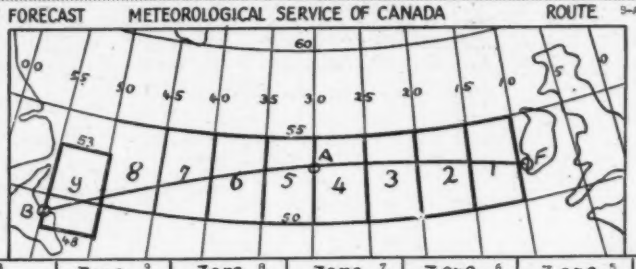
The staff of the meteorological office consisted of three officers and three plotters. The station was well equipped, having the full complement of instruments for a first-class telegraphic reporting station, pilot balloon equipment and, by arrangement with the Air Ministry and the Newfoundland Government, a seaplane available for daily meteorological ascents.

If a digression is permitted, a word of praise for the pilots of this Fairchild seaplane is certainly warranted. Working under the disadvantage of having their hangar and accommodation at Norris Arm, six miles away, while operating from Botwood, and with no blind-flying or homing equipment, they recorded a commendable series of ascents to a very fair altitude. Meteorographs were used on every

The central building and transmitting station at Botwood. The little wing on the left is the meteorological office, the interior of which is shown on the opposite page.

A typical meteorological information sheet handed to the pilot before departure on one of the Atlantic crossings. The diagrammatic map is divided into different areas, for which the conditions are duly given in the typed table. The amount of recording and forecast work involved in the compilation of the sheet may well be imagined.

Sept.22 FLIGHT FORECAST METEOROLOGICAL SERVICE OF CANADA ROUTE S-A



	Stn B	Zone 9	Zone 8	Zone 7	Zone 6	Zone 5	Stn A
TIME	20.33	22.08		23.40	0100	02.18	03.38
WEA	light showers	light showers	cloudy	overcast	partly cloudy	partly cloudy	partly cloudy
CLD	8-10 Sc. & Cb.	8-10 Sc. & Cu.	8-8 Sc. & Cu. 3-4 Ac.	8-10 Sc. & Cb. 4-5 Ac.	3-4 Sc. 3-4 Ac.	3-4 Sc. 3-4 Ac.	3-4 Sc. 3-4 Ac.
CIG	1000-2000 ft.	500-1000 ft.	2000-3000 ft.	2000 ft. decreasing to 100-200 ft.	increasing to 1000-2000 ft.	2000-3000 ft.	2000-3000 ft.
CLD TOPS	8000 ft.	8000 ft.	9000 ft.	12000 ft.	9000 ft.	9000 ft.	9000 ft.
VIS	6-12 mi.	6-12 mi.	12-31 mi.	6-12 mi.	6-12 mi.	12-31 mi.	12-31 mi.
WIND SURF	20 deg 7-12 mi.	300 deg 10-15	300 15-20	280 25-30	220 28-33	220 20-25	230 15-20
2000'	310 12-17	310 20-25	310 25-30	290 30-35	220 30-35	230 25-30	240 25-30
5000'	310 25-30	310 25-30	300 30-35	300 35-40	230 35-40	240 30-35	250 25-30
10000'	310 25-30	310 25-30	300 30-35	300 35-40	240 35-40	250 30-35	250 25-30
ICING	3000-9000 ft. in cloud	6000-9000 ft. in cloud	6000-9000 ft. in cloud	6000-9000 ft. in cloud	nil	nil	nil
SEA LDG FLD	slight	moderate	moderate	moderate	rough	rough	moderate
REMARKS				cold front across course at 40 w. moderate showers at cold front.			
GEN INF 1300 chart	A deep depression is centred at 58 N. 50 W. and is moving slowly north and filling. A cold front from the centre lies across the course at 43 W. and is moving east 25-30 m.p.h. A weak back-vent occlusion will lie entirely above the course						

Date Sept.22 39 Hr 18.37 METEOROLOGIST

flight, and the results thus obtained, coupled with the eye readings from the strut psychrometer and the pilots' observations, gave the only definite information available on the structure of the "fronts" moving out over the Atlantic, the associated icing conditions and cloud systems. The information from these ascents, together with weather and pilot balloon reports, were transmitted daily to Foynes, Port Washington, Montreal and the Head Office in Toronto.

The combined staffs were faced with a strenuous task in getting everything in shape for the summer's programme. The receiving and transmitting of the meteorological data alone proved a formidable task with the equipment available. The demands of the meteorological officers increased hourly until, on the eve of the first flight, between 10,000 and 12,000 words of meteorological information were being handled daily. Half of this was received in the form of broadcast collective messages from Arlington, Rugby, Louisberg, Julianehaab and Norddeich. The other half was in point-to-point communication with Foynes, St. Huberts, Port Washington and North-West River. The broadcast meteos and communications with St. Huberts and North-West River were handled on three receivers and a key in the meteorological office; the remainder were dealt with in the wireless receiving building. Communication between this building and the meteorological office was still limited to a boy on a bicycle, but the distance was now only slightly over five hundred yards.

Radio Co-operation

An account of the troubles experienced in the establishing of the necessary wireless schedules, which reached a maximum of fifty-three per day exclusive of air-to-land communication, with the dawn effects in the early morning schedules with St. Huberts, in the northern lights and their effects on short waves, and with skip distances would be out of place here. But without the untiring efforts of the Botwood wireless staff and the full co-operation of all the stations involved, the meteorological office would have been seriously handicapped by lack of information.

The meteorological data collected, comprising over ninety per cent. of the total traffic handled by the wireless station, provided the material for four weather maps per day, each covering the region from the Pacific Coast of North America to the Eastern boundaries of Europe and from latitude Twenty North to Northern Greenland, two aerological maps of North America, and various upper air charts and forms. Part of this information, consisting of a selected list of American station reports and ship reports, was relayed four times daily to Foynes.

The first test of this organisation came on June 27. On the 26th a twenty-four-hour notice of departure was received from *Clipper III* for a flight from Port Washington to Botwood via Shediac, leaving at 12.00 G.M.T. on June 27. At 10.00 on the 27th a weather report for Botwood and a flight forecast for the route Shediac to Botwood was despatched to Port Washington. At 11.00, and every hour thereafter, on the hour, a Botwood weather report was sent to the machine. With the fourth of these the Botwood upper wind report was included and fifteen minutes before the machine was due at Botwood the landing report was sent. In return, the crew sent hourly weather reports and these were checked step by step with the forecasts.

Clipper III left Port Washington at 11.35 G.M.T. and, after a stop of one and a half hours at Shediac, arrived in Botwood at 22.21. The return flight on the 29th was conducted on similar lines. The round trip ran very smoothly and, as was to be expected, brought to light a few weak links in the organisation. These faults were quickly removed and the necessary revision of schedules made.

The complete test began on July 3 when *Clipper III* left Port Washington for her first Atlantic crossing. The trip to Botwood was uneventful. All schedules were satisfactorily maintained and the machine covered the route, in-

The administration building in process of construction at the Newfoundland airport. The view is taken from the north-west end of No. 2 runway.

cluding a stop at Shediac, in just under eight hours.

On the following day "flying schedules" commenced.

This meant that every six hours the Foynes and Botwood meteorological offices exchanged appreciations of the weather over the North Atlantic and twelve-hour forecasts for the respective bases. For this the Atlantic Ocean was divided into two parts at longitude 30° W., Foynes sending appreciations on their analysis of the weather to the east of 30° W., and Botwood of that to the west. On the first of these exchanges a certain difference in analysis was evident, but in the course of twenty-four hours these differences had so diminished as to be insignificant. With other stations "flying schedules" meant an increase in the number of schedules and a general speeding-up in the handling of all messages.

Departure was set for 21.00 G.M.T., July 5. At 19.00, July 4, a preliminary flight forecast was issued, followed by a discussion with the captain of the Sikorsky on the forecast and the current weather maps. On the strength of this discussion and the favourable conditions forecast, the twenty-four-hour departure signal was sent out for a great circle route, leaving at 21.00 on July 5. Simultaneously, a signal was received from the captain of *Caledonia* at Foynes for a departure on a rhumb line course, off 18.00, July 5. Eighteen hours later a revised forecast was issued to the Sikorsky, and it was encouraging to find that very few alterations in the preliminary forecast were necessary.

The First Crossings

Two hours before the time of departure a final forecast for the route was issued and, this time, no alterations were necessary. At the same time the captain was given a copy of the latest weather map of the North Atlantic, the Botwood upper wind report, the Botwood weather report, and a forecast from Foynes of the weather conditions expected there for the estimated time of the flight.

The Clipper took off at 21.10, and on every hour until 30° W. was passed the Botwood weather was sent to the machine. As before, similar reports were sent from the machine and the forecasts checked with them step by step, a careful watch being kept on the Atlantic pressure systems, and any indications of unanticipated developments were to be communicated to the machine immediately, with the necessary revision of the forecasts. None was necessary, and at 02.00 on July 6 *Clipper III* passed out of the Botwood zone of control. Simultaneously, *Caledonia* moved in. Weather reports continued to be issued hourly, but a different system was now in operation, and all such reports were handed to the wireless operators to be supplied to the aircraft only on demand. At 04.03 a forecast was issued to *Caledonia* covering the remainder of the course, and at 10.00 the first leg of the flight was over.

As for the forecasts, the wind estimates had turned out very well both for velocity and direction at the altitudes flown. The amount of cloud was considerably underestimated and, in the opinion of the writer, this was due to a back-bent occlusion of unprecedented length trailing across the Atlantic. A complete study of that and similar situations is being undertaken. The other elements of the forecasts were all reasonably accurate. These results showed that the final analysis derived from the interchange of appreciations between Foynes and Botwood gave a good representation of the Atlantic weather.

On the following day a discussion was held with the captain and the first officer of *Caledonia*. Much valuable first-hand weather information was obtained, the forecasts re-checked, and the general procedure subjected to a very thorough examination.

Weather conditions being fair, a departure signal was issued for the next leg, Botwood to Montreal for July 8, off 12.00 G.M.T. On the following morning a route forecast was received from the meteorological office at St. Huberts (Montreal) and, on the basis of this and the weather maps at Botwood, a flight forecast was issued at 10.00, together with upper-wind and weather reports.

From July 8 to July 13 the machines were out of the Botwood zone of control, and there was time for a more complete analysis of the forecasts and a search for the causes and explanations of their shortcomings. On July 13 a forecast was sent to St. Huberts for the return flight of *Caledonia* to Botwood and flying schedules were brought into operation again.

And so the flights continued. With each one new experiments were tried. On the first West-East flight of *Cambria* a cross-section map of the Atlantic, showing anticipated cloud structure, ceiling and tops, was attached to the forecast and found favour with the captain. On the second flight of *Clipper III* a future weather map of the Atlantic was issued, giving the isobaric configuration and frontal zones anticipated at each point along the course at the estimated time of passage of the aircraft across the point. An Atlantic map, showing the names and the positions of all ships near the course at the latest report received and their estimated positions at the time the aircraft was expected to be in their vicinity, proved useful and was included with all forecasts.

Special mention must be made of the Atlantic shipping and the splendid way in which it responded to the increased demand for meteorological information. A few single-operator ships were sending four observations a day when in the Botwood zone, while most responded with two or three.

Some Difficulties

The problem of forecasting the weather at Botwood was found to be none too easy. Being very near the northern limit for tropical air, it was always difficult to determine whether the warm air just would, or would not, quite reach the station. This condition was critical, as the weather in the two cases differed widely. The vigorous cold fronts coming down from Northern Quebec and Labrador were difficult to locate accurately, there being no meteorological reporting stations in the region. This difficulty was greatly decreased during the course of the summer by establishing meteorological reporting stations at North-West River and Sandgirt Lake in Labrador, and at Port Harrison on the east coast of Hudson's Bay.

Facing the prospects of a severe winter with a cheerfulness that has been characteristic throughout the summer, the entire Botwood staff is vigorously preparing for next season's flying. Further sources of meteorological information are being sought for, technical troubles eradicated, and researches undertaken on the causes of the minor failures experienced during the past summer.

CORRESPONDENCE

The Editor does not hold himself responsible for the views expressed by correspondents. The Names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

GORELL, 1933-38

I APOLOGISE for raking up the dead past, but do you remember a thing called the Gorell Committee Report? And do you remember the Loch Ness Monster? They both created a stir about the same time, but the generation growing up since then seems to regard both as somewhat mythical.

The Government accepted the report "in principle," and the Press accepted the Monster in practice, but did the Monster swallow the Report—certainly we poor fools did—and is that why no ripple stirs the official loch? We know from the habits of the creature that the Ministry would probably retire to the depths for some time to digest its victim, but we really had hoped that the meal would provide refreshment and stimulus rather than add to the beast's notorious lethargy.

The Committee was set up in July, 1933, reported in April, 1934, and the report was published and accepted in July, 1934. It is still being "implemented" with stalagmitic haste in 1938, and the Civil Aviation department of the Ministry to-day has not, apparently, the foggiest idea when it will come into force.

Speaking from my own knowledge, sir, I know that serious full-scale experimental work has been held up in the past year or two by the Ministry's failure to implement the Report. To put it bluntly, the men (if that is the right word) responsible are hindering development beyond their understanding.

The pity of General Brancker's loss is more and more apparent with the years. W. E. GRAY.

Edgware.

DIVE BOMBING DEFENDED

PURSUING the discussion on dive bombing instigated by Air Chief Marshal Sir Hugh Dowding's astonishingly sweeping remark that dive bombing is "not now very practical in the R.A.F.," may I be permitted to get down to cases, a procedure which seems to be singularly distasteful to writers (your correspondent "Realist" excluded) on this topic.

I think I am right in saying that, quite apart from the Blackburn Skua, which is a more or less specialised Fleet dive bomber built to the modern formula, the Fairey Battle and Hawker Henley, representative of the most advanced practice in the design of high-speed single-engined bombers, are stressed for steep diving attacks and incorporate appropriate bomb-stowage arrangements.

The latest German Hamburger single-seater dive bomber looks almost exactly like the original cranked-wing Spitfire, and must have an impressive diving speed. Moreover, Heinkels have a most modern-looking two-seater, reminiscent of the He. 70, which they are offering as a dive bomber; the latest U.S. Navy equipment for dive bombing is a very clean Northrop with retractable undercarriage; and France is continuing experiments with the cranked-wing Nieuport monoplane (now a single-seater), the prototype of which, did, admittedly, break up in a dive.

All of which seems to indicate that, unless some of the foremost tacticians and designers are utter dolts, dive-bombing is, after all, practical from the clean, modern monoplane. It is, of course, becoming desirable to fit drag-producing devices in the form of flaps, drogues or airscrews of reversible pitch, and matters are further complicated by the bomb release problem.

In many instances the very steep dive from a great altitude may be impractical due to considerations of weather or equipment, but a comparatively shallow approach may be possible (French *bombardement en semi piqué*) though this is likely to give defensive A.A. machine guns a golden opportunity in addition to the pom-poms and larger "Archies."

Referring to the figures quoted by "Realist"—I deduce that the 850 m.p.h. quoted is a printer's error for 550 m.p.h. [that is so—ED.]—these are, as he infers, quite appalling, though a bombing dive from, say, 15,000, by a clean monoplane with suitable air brakes is a different proposition from a T.V. dive from 30,000 feet. SURREALIST.

London, S.W.9.

THE PLACE OF THE COMPASS

FROM a leaflet recently sent me by the Air Ministry I gather that trust in the compass needs official support. A few years ago a very highly placed member of that Ministry, introduced to me in a foreign aerodrome, rather suprised me by a remark to the same purport. He had asked about my navigational methods and, on being told them, said, "I wish we could get the young fellows in the Service to do that. They'll go fifty miles out of their way to follow a railway." When I was sent up to do the 6,000 feet test, the machine had no compass, and I was in cloud at 5,000! The instructor may have had little faith in the instrument, but I carried one about the size of a sixpence on a wristlet I wore hunting. Now I think I have discovered why the compass has been so long neglected in the air. Manufacturers have been putting it in absurd places—down in the bowels of the craft where light is bad and, at times, non-existent, and away to one side of the steersman.

That is not done in ships. The binnacle is brilliantly illuminated and the man at the wheel is directly behind it. There is no unnecessary exertion imposed on his mind or muscle. The head of a ship swings off the course when she rolls or when the bow rises to a roller. It may or may not swing true again as she rolls back or the bow falls. Here comes in the skill of the quartermaster. A good one has "hands" and intuition. A poor one costs his company many extra hours of oil or coal and wage consumption. To hold an airplane on a bearing is child's play compared with holding a ship on one. But that is no reason why the manufacturer should give the air pilot quite unnecessary exertion. The compass should be easy to read, however bad the light, and it and the pilot should be on a line parallel to the fore and aft axis of the machine.

Uttoxeter. A. J. RICHARDSON.

About 1937 Achievements

MISS JEAN BATTEN'S own account of her Australia-England flight appears in *Achievements of* 1937, shortly to be published by C. C. Wakefield and Co., Ltd. The booklet, which is very fully illustrated, also tells the story of the many other achievements by air, land and sea in which Castrol oil has played a part during the past year.

Achievements of 1937 can be obtained free and post free by readers of *Flight* on application to C. C. Wakefield and Co., Ltd., 30-32, Cheapside, London, E.C.2.

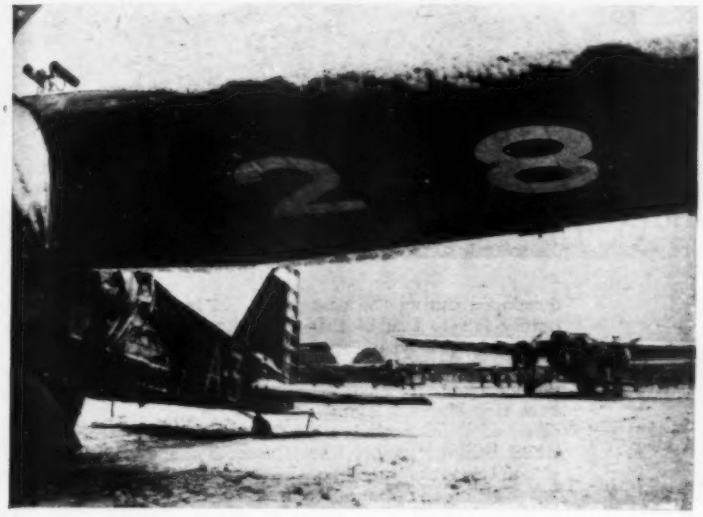
Forthcoming Events

January 11. R.Ae.S. Isle of Wight Branch Lecture: "Aircraft Inspection Methods," by Mr. R. H. Longe.
January 13. R.Ae.S. Lecture*: "Radio as a Direct Aid to Landing Approach," by Sqn. Ldr. R. S. Blucke.
January 14. Strathtay Aero Club: Annual Ball.
January 18. R.Ae.S. Students' Section Lecture: "Turbulence and Skin Friction," by Mr. A. A. Hall.
January 19-21. Aerodrome Owners' Association: Airports Conference, London.
January 20. R.Ae.S. Portsmouth Branch Lecture: "Aircraft of the Future," by A. Hessel Tiltman.
January 20. R.Ae.S. Coventry Branch Lecture: "Installation of Aero Engines," by Dr. G. P. Douglas.
January 25. R.Ae.S. Isle of Wight Branch Lecture: "Bird Flight," by Capt. J. Laurence Pritchard.
January 26. R.U.S.I. Lecture: "Imperial Air Routes," by Lieut.-Col. H. Burchall, Royal United Service Institution, 3 p.m.
January 27. R.Ae.S. Discussion*: "High Wing Loading and the Three-Wheeled Undercarriage."
January 28. Northamptonshire Aero Club: Annual Ball at Salon de Dance, Northampton.
February 3. R.Ae.S. Lecture*: "Recent Research on Aerodynamic Characteristics," by Mr. E. F. Relf.
February 9. York and Leeming Flying Club: Annual dance, Grand Hotel, Harrogate.
February 10. R.Ae.S. Portsmouth Branch Lecture: "Cowling and Cooling of Radial Engines," by Dr. G. P. Douglas.
February 17. R.Ae.S. Coventry Branch Lecture: "Aircraft Motive Power," by Major F. F. Green.
February 17. R.Ae.S. Lecture*: "Maintenance of Civil Aircraft," by Mr. H. L. Hall.
February 21-March 4. British Industries Fair.
February 25. Hampshire Aeroplane Club. Annual Dinner and Dance, South-Western Hotel, Southampton.
March 3. R.Ae.S. Lecture*: "Riveting Methods in Germany," by Dr.-Ing. W. Pleines.
April 7. R.Ae.S. Lecture*: "The Manipulation of the Boundary Layer," by Mr. E. G. Richardson.
April 21. R.Ae.S. Lecture*: "Factors Controlling the Development of Electrical Ignition on Aero Engines," by Dr. G. E. Bairstow.

* All these lectures take place at the Institution of Mechanical Engineers, Storey's Gate, St. James's Park, London, S.W.1., beginning at 6.30 p.m.

THE FOUR WINDS

ITEMS OF INTEREST FROM ALL QUARTERS



TEMPERATURE RANGE: The wintry scene on the left shows French Bloch bombers at Orly after manœuvres abroad. On the right, a British Lewis gun team somewhere out East on the defensive.

THE I.A.T.A. has agreed to a 10 per cent. reduction in airline fares for visitors to the Leipzig Spring Fair from March 6-14. This will include the route from London.

The Chief of the Argentine Air Force, General Verdaguer, has been invited by General Goering, the German Air Minister, to visit Germany on a "study trip."

As we go to press there is no news of Mlle. Maryse Hilz, who was last seen over Jask, on the Persian Gulf, on the Karachi-Cairo stage on her attempted flight from Saigon to Paris.

The Royal Aero Club is supporting a recommendation that a radio band be reserved for air tourists, and also that an international radiotelephonic code be developed. This proposal will be considered at the International Conference on radiocommunication, to be held in Cairo in February.

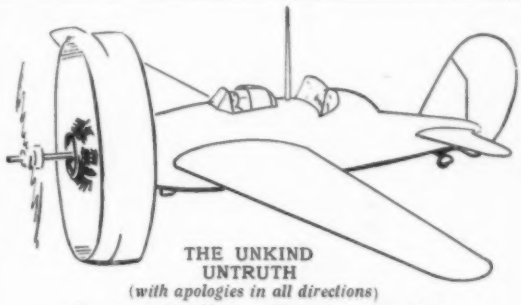
Two Belgian Reserve airmen terminated prematurely an experiment which was to have lasted a week, to examine the effect on the human system of the loss of atmospheric pressure at great heights. A special chamber inaugurated last year by King Leopold at Evère was used.

The Union Syndicale des Industries Aeronautiques announces that the sixteenth Paris International Aero Show will be held at the Grande Palais in November. The exact date, apparently, still remains to be decided.

Next Thursday, January 13, Sqn. Ldr. R. S. Blucke, A.F.C., will lecture before the Royal Aeronautical Society on "The Practical Use of Radio as a Direct Aid to Landing Approach in Conditions of Low Visibility." The lecture will be given at the Institute of Mechanical Engineers, Storey's Gate, London, S.W.1, at 6.30 p.m.; tickets through members.

Mr. Francis Neville Chamberlain, the Premier's twenty-three-year-old son, has become a gunner in the Birmingham Business Men's Battery of the 69th Anti-Aircraft Brigade, R.A. (T.A.).

Mr. R. C. Fairey has accepted an offer to become Honorary Colonel of the 27th Anti-Aircraft Battalion (London Electrical Engineers), R.E., of the Territorial Army. The work of this battalion is the operation of searchlights.

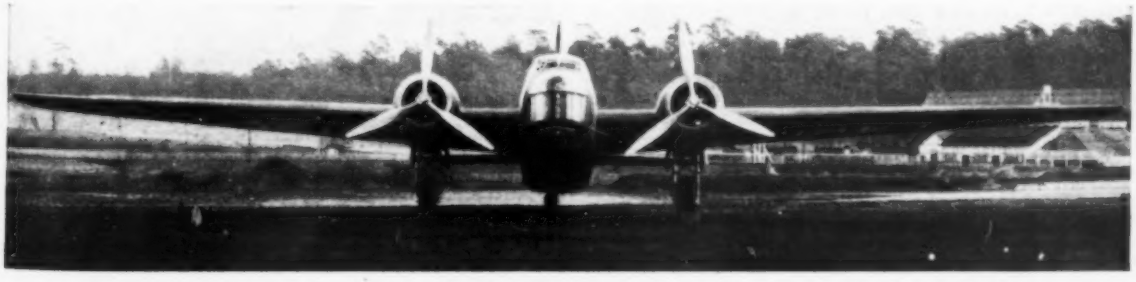


THE UNKIND UNTRUTH

(with apologies in all directions)

No. 11: The Vickers Wesley or Sky-pilot.

Flying from Gravesend to Hanworth last week, Mr. R. H. Henderson made a successful forced landing on Crystal Palace race track, later taking off again without trouble.



GEODETIC BOMBER: The production-type Vickers Wellington I medium bomber awaiting tests at Weybridge.

PRIVATE FLYING

SEAPLANE CONVERSION : A Stinson SR—9D Reliant seaplane used in Canada by the Imperial Oil Company. The extra fin below the fuselage—to balance the effect of the floats which provide excessive side area ahead of the c.g.—is a noteworthy modification to the standard version of the machine. The actual and necessary size of the floats explains some of the difficulties involved in any conversion.

Topics of the Day

Another Year

FOR some reason which is not as clear as it might be, it is customary at this time of the year to review the past—and, less usually, to make Old Moore-ishly vague prophecies about the future.

Unfortunately, when underneath the tent of prophecy, I find it almost impossible to prevent myself from forecasting the future as I should like it, and not as other people will undoubtedly make it. In fact, and presupposing the continuance of at least a purely local condition of peace, things at the end of 1938 will probably be exactly the same as they are at this moment—except that we shall all be a year older and, consequently, either wiser or less tolerant according to our particular glandular arrangements.

However, I will state my own ideas, for what they are worth, in the matter of the private owner's or the amateur's demands.

First and foremost, of course, practically everything else must be subordinated to safety, plain and simple. That does not necessarily mean a low landing speed (which can cause trouble in gusty breezes) or even, by itself, a completely viceless stall. This last may be accompanied by other less pleasing characteristics, and, in any case, it is still possible to get into expensive, if non-fatal, trouble, particularly when this feature is used as a means of losing height near the ground.

Safety First

REAL safety involves a number of co-ordinated features, including a really useful range of vision, ample control near the stall (however innocuous), a short take-off, a steep climb which may be started as soon as the machine can be pulled off the ground, and an undercarriage which will take almost anything that it is possible to provide in the way of mishandling.

Good take-off and climb do not necessarily involve a more than ample power reserve with consequently higher first and subsequent costs. I look to the development of something new in flap gear, which can be adjusted easily and vicelessly to provide either high lift or real drag in varying degrees. There is nothing idealistic about that, and the transport designers will need to produce such a device if their contrivances are going to be anything more than mere subsidised projectiles.

For the rest, these safety demands are quite ordinary. There are none which have not, or could not, have been incorporated in any of the machines built during the past decade.

I have already written quite lengthily enough about tricycle undercarriages and confess to looking on the Stearman - Hammond as the most rational machine developed during the past year. In fact, of course, it is hardly fair to talk of this as a 1937 design, since it first appeared three years ago and was probably flying about in its present form before the beginning of last year. The nosewheel arrangement necessarily involves either a pusher or a twin-engined layout, but if a tractor design is to be prepared there is always the Cowey tricycle with the third wheel behind. Apart from tractor demands, this method of applying the principle—with a steerable rear wheel—has certain advantages. For instance, the c.g. problem is not so acute, the results of structural failure are not likely to be so serious, the braking load is all being taken by the "real" undercarriage, and retraction difficulties should be reduced.

Whatever may be the future of the very light type of aeroplane, it is certain that its manufacturers must do their best to see that the cruising speed is high enough to deal with reasonable headwinds, and in this connection a satisfactory non-stop endurance is obviously essential. Prospective owners will not always be satisfied to cruise around aerodromes in fine weather, though there should be a small market for "hourage obtaining" single-seaters. These, however, must have very normal characteristics, or their training and amusement value will be doubtful. Finally, the little fellows *must* have useful luggage accommodation. Nobody really likes travelling with a toothbrush

Among the more experienced manufacturers there is a feeling that 80 b.h.p. is the safe minimum for any two-seater, and that 50 b.h.p. is the same minimum for single-seaters. They may be right, though perfectly good machines are flying about quite strongly with very much less power. It seems to be largely a matter of size and consequent stability in bumps. Obviously it is necessary to have plenty of power if a full-sized light aeroplane is going to give reasonable results, and the matter then boils down to that of producing such a machine at a low price. If only the market is available, there is no reason why a proper two-seater cabin aeroplane with plenty of useful power should not be sold for £500. Unfortunately the market is not obviously available at present and the Reserve scheme hardly helps matters. A young man who can fly almost as much as he cares to fly at the expense of the Government is not likely to spend £500 (plus running costs) on a machine of his own.

Going Marine

AS for seaplanes, not one is yet available. Possibly nobody wants such a thing in this country, though, as I've remarked before, there should be a niche for at least one seaplane or small flying-boat club on the south coast and in an area where a sufficient quantity of marine-minded persons may be expected to be able to pay the rather high flying charges.

In America, with, generally speaking, altogether heftier and more generously powered machines, the floatplane is reasonably popular, but it must not be forgotten that the

fashion has spread into the smaller field and that Aeroncas and Cubs with floats are being used quite a lot. I don't know what floats cost over here—probably, as they must at present be specially made, they cost almost as much as the machine itself—but a machine like the Hornet Moth or the Witney Straight should still have a very useful performance when transformed into a sea-going vessel. There is at least one Hornet seaplane flying satisfactorily in Canada. By the way, what's the matter with *wood* floats? Present-day knowledge of plastics should make it possible to manufacture them of bakelite-wood sandwich so that "soaking" is no longer a trouble. Anyway, I was told the other day by a firm which knows something about such things that it would be reasonable to make a pair of floats on such lines for fifty pounds—or certainly for something less than a hundred.

Anyway, there it is. If amateur pilots could be more easily persuaded to say what they wanted, somebody might be prevailed upon to put up the necessary cash to start such a club or at least to go very carefully into the matter and to work out the probable flying costs.

INDICATOR.

FROM the CLUBS and SCHOOLS

LONDON

THE low flying time recorded by the London Aeroplane Club—6 hr. 45 min.—is explained by the Christmas holidays, there having been no flying on five days. New members include Messrs. E. South, D. B. Seigal and H. Bowman.

MARSHALL'S

Flying times at Marshall's Flying School for the week ended January 2 totalled 15 hr. 35 min. There was no flying for three days over Christmas.

READING

A dance is to be held on January 6 by the Reading Aero Club. Four new members joined during the Christmas holidays, namely, Messrs. Aspe, Samson, Desborough and Dodds.

CINQUE PORTS

A review of the Club's activities during 1937 very satisfactorily show a total of 2,500 hours flying, twenty-four "A" licences and thirteen "B" licences. The aircraft in use were Tiger, Gipsy and Leopard Moths, B.A. Swallows, a Monospar and an Aeronca.

HAMPSHIRE

The twelfth annual dinner and dance will be held at the South Western Hotel, Southampton, on Friday, February 25. "A" licences were obtained by Lt. F. H. E. Hopkins, R.N., and Mr. G. H. Jackson; the latter had made his first solo during the week. A total of 60 hr. 45min. flying shows very little interference from the Christmas holidays.

BROOKLANDS

The annual general meeting is to be held at 8.15 p.m. on Saturday, January 22, 1938. The flying school and club reopened on January 1 after the Christmas holidays. The main rooms of the clubhouse have been completely redecorated, and everything is set for bigger and better flying. A party of members from the Cinque Ports Club attended the tea dance last Sunday.

PENANG

Among the visitors during November were six Vildebeests of No. 36 (T.B.) Squadron, Singapore, a Miles Magister from the Royal Singapore Flying Club, and a Miles Falcon owned by Mr. Stanley. Mrs. Oke obtained her Straits Settlements "A" licence tests. She is the fifth woman to be trained by the Club. Flying times for the month proved rather disappointing, due to bad weather; 108 hr. 35 min. was spent in the air. This included the usual cross-country flights to local aerodromes.

HANWORTH

Although the London Air Park Flying Club was closed during the Christmas holidays from the 24th to the 28th, 34 hr. 40 min. flying was logged. A New Year's Eve dance was held at the Hanworth Park Hotel and was attended by about 250 members and their guests. Mr. T. Robinson is a new member.

LEICESTERSHIRE

The prevalence of bad weather during December had a marked effect on the Leicestershire Aero Club's flying for the month, which totalled 24 hr. 15 min. Mr. H. G. Taylor made his first solo and two cross-countries were carried out. The annual general meeting and luncheon was held on the 17th and the Christmas fancy dress dance in the clubhouse on the 10th.

NORFOLK AND NORWICH

A record attendance was experienced at the New Year's Eve dance. Music was provided until 2 a.m. by Mr. Reg Tyrell's band. A notable visitor, from Taunton School, was Dr. H. Birchall, the founder of the Public Schools Aviation Camp. Mr. J. Storey, who has a "B" licence in view, has just passed his "A" licence tests. Flying was well up to average despite the Christmas holidays.

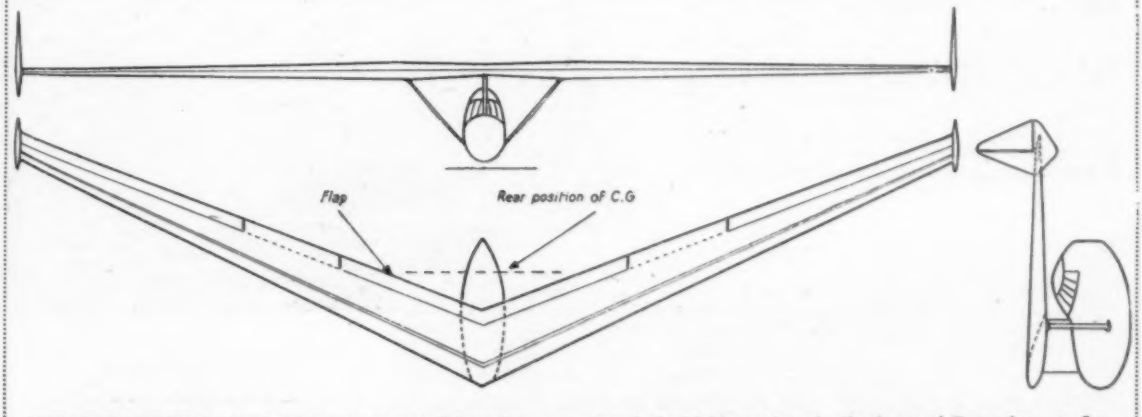
HERTS AND ESSEX

To the strains of the Club's band, dancing continued until the small hours at the Boxing Day party. Mr. J. H. Reyner's guests were winners of the treasure hunt. "A" licences were obtained by Miss R. M. Hughes, Mrs. A. R. Frogley and Mr. J. H. Folliard. Flying was possible on only ten days of the last fortnight in December, but totalled 67 hr. 48 min., while for the whole month 150 hours were logged.

C.A.S.C.

A very satisfactory total of 1,475 hours' flying has been put in by the Civil Aviation Service Corps since its inception, and during last year a total of 504 hours were flown at Cambridge and 188 hours at Gravesend. Nineteen members obtained their "A" licences in 1937, and three more have already gone solo and are only waiting for reasonable weather before carrying out their tests. Members assisted with aerodrome duties at fourteen different flying events during the year. Until the future of Gravesend Airport has been settled the members of No. 4 Squadron will do their flying at Cambridge.

In spite of low cloud in the morning and heavy rain later, members flew 5 hr. 50 min. at Cambridge last Sunday. Three more members have been passed out for handling aircraft on the ground and several more received instruction in this direction.



ADVANCED DESIGN: During his lecture on sailplane design, a résumé of which was given in the issue of December 23, Sqn. Ldr. G. M. Buxton suggested that the tailless type might be developed in the interests of all-round efficiency. This is his own projected design for such a machine.

8,000 MILES ON 40 H.P. Mr. J. Clancy (shaking hands) and Mr. R. H. Julius welcomed back by Mr. Bridgeland, secretary of the Royal Australian Aero Club, from a remarkable 8,000-mile flight round Australia in a Taylor Cub (40 h.p. Continental) by far the lowest-powered of the few machines which have ever made the circuit. Starting from Sydney and flying in an anti-clockwise direction, they made excellent progress, their only difficulties arising from primitive aerodromes and from navigational problems of the kind encountered when flying over hundreds of miles of territory virtually barren of any landmark. Between Perth and Adelaide they followed the longest stretch of dead straight railroad in the world—400 miles. The other snapshot above shows a typical stretch of the uninviting country over which the little machine flew. Mr. Julius is a partner in the firm of Julius Gardiner and Co., of Sydney, who are handling the Cub in Australia, following an introduction by Mr. "Bill" Shackleton when he was visiting America some time ago.

A King's Vega Gull

A PERCIVAL Vega Gull with a Series II Gipsy Six and v.p. airscrew has recently been flown out to Baghdad by Flt. Lt. Barringer. This machine is for the personal use of H.M. The King of Iraq, and has extra tanks to give it a range of 1,100 miles.

Incidentally, it was during his return from this trip that Flt. Lt. Barringer sustained minor injuries when the Imperial boat *Cygnus* crashed during take-off at Brindisi.

A Brooklands Year

SOME 6,600 hours were flown by the associated clubs at Brooklands, Shoreham and Northampton during the year which ended on November 30. Of this total the Brooklands Club itself put in 4,500 hours and obtained 60 "A" and seven "B" licences. In all, the trio trained nearly a hundred pilots from the *ab initio* stage and eight others passed their Second Class Navigators' examination.

During the year the Brooklands Club was re-equipped with Tiger Moths, and new offices and hangars, replacing those destroyed by fire in 1936, were completed. The clubhouse has been redecorated, and will shortly be refurnished.

Monthly competitions have been held at Brooklands, and the club's machines were flown to all the dawn patrols held in the Southern Counties, of which the Shoreham event produced another attendance record of 75 machines. Brooklands, the inventor of the dawn patrol, provided a special innovation in the form of a supper patrol.

Inexpensive Tuition

THE Portsmouth Aero Club is starting a new training scheme. From January to March there is to be a special spring course for people wishing to qualify for their "A" licences.

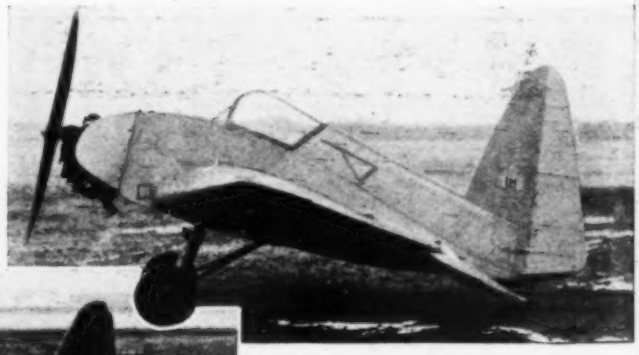
The club is making a special offer in which, for an inclusive fee of £25, pupils are given full membership of the club, tuition, and the payment of all fees.

A Handy Diary

"The Airman's Diary"; 1s. 6d., Geo. Newnes, Ltd.

THIS 1938 pocket diary contains any amount of aeronautical information and illustration. Although some of this is in rather elementary style to appeal to the very youthful enthusiast, there is so much useful data that anyone connected with aviation should find the diary a thoroughly useful pocket reference book.

With a little single-seat monoplane (below) designed and built by himself, M. Tonya recently broke the world's altitude record for single seaters of less than 2 litres engine capacity. He reached a height of 16,240 ft. with a 40 h.p. Train 4.T. engine. After taking this record M. Tonya at once took off with a co-pilot, M. Saboureault, on a two-seater machine, L'Aile Volante A.V.10 (right), and reached a height of 22,965 ft.—a record for the class with a cylinder capacity of under 4 litres. The engine was a specially prepared 75 h.p. Pobjoy.



TWO FRENCH RECORD-BREAKERS—ORTHODOX AND UNORTHODOX

Boeing YB-17 heavy bombers (four Wright Cyclone Gs) of the U.S. Army Air Corps fly past the Wright Memorial at Kitty Hawk, North Carolina, in commemoration of the Brothers' flight.

PLANE FACTS from the STATES

Projection and Production : The Four-engine Era : Some Hitherto Unpublished Notes : Tritons and Minnows

THIS illuminating contribution from an American correspondent, couched largely in indigenous terms, surveys some important developments, particularly with regard to four-engined landplanes and flying-boats. It presents a good deal of more-or-less exclusive information in relation to published facts and introduces a number of new American aircraft

THE American aircraft industry is now at one of the most prosperous periods of its history, and with this attainment has come progress. New machines of all sorts, from the small sport machine to giant air liners, are being created in astonishing numbers. New aircraft companies are perpetually springing up overnight in confusing profusion. One could, of course, go on indefinitely describing projected craft, such as the 550-foot Klinehans flying boat or the equally large 500-passenger boat designed by Mr. Laddon, of the Consolidated Aircraft Corp. However, our accent here will be on actuality—planes that are about to make their first test hop or are now in the actual stages of production.

In the "giant" category there is plenty of food for thought. Boeing was the first to come forth with a modern four-engined machine in the United States, a 105-foot high-speed bomber, thirty-nine examples of which will take their places in the U.S. Army Air Corps. At about the same time Curtiss had announced plans for building a huge four-engined land transport, but the news seemed of minor importance when, shortly afterwards, the major American airlines pooled their money and resources and ordered a Douglas D.C.4 powered by four 1,400 h.p. engines. The design of the D.C.4 was by no means an easy matter, and, true to Douglas's tradition of building the last word in transport aircraft the machine was practically redesigned two or three times in order to keep up with the very rapid developments in design. The tricycle landing gear is probably the most interesting new feature of this ship, which is now well advanced.

The surprises came, however, when T.W.A., apparently endeavouring to forge ahead of their rival airlines, United and American, ordered six four-engined Boeings for quick delivery, with a reported option on seventeen more. At the same time, Pan-American Airways ordered two Boeing 307-S transports of similar design but equipped for operation at higher altitudes. T.W.A. plan to start out with their first six Boeings at about 10,000-15,000 feet, and gradually to work up to the higher levels. Pan-American will fly at about 20,000 feet.

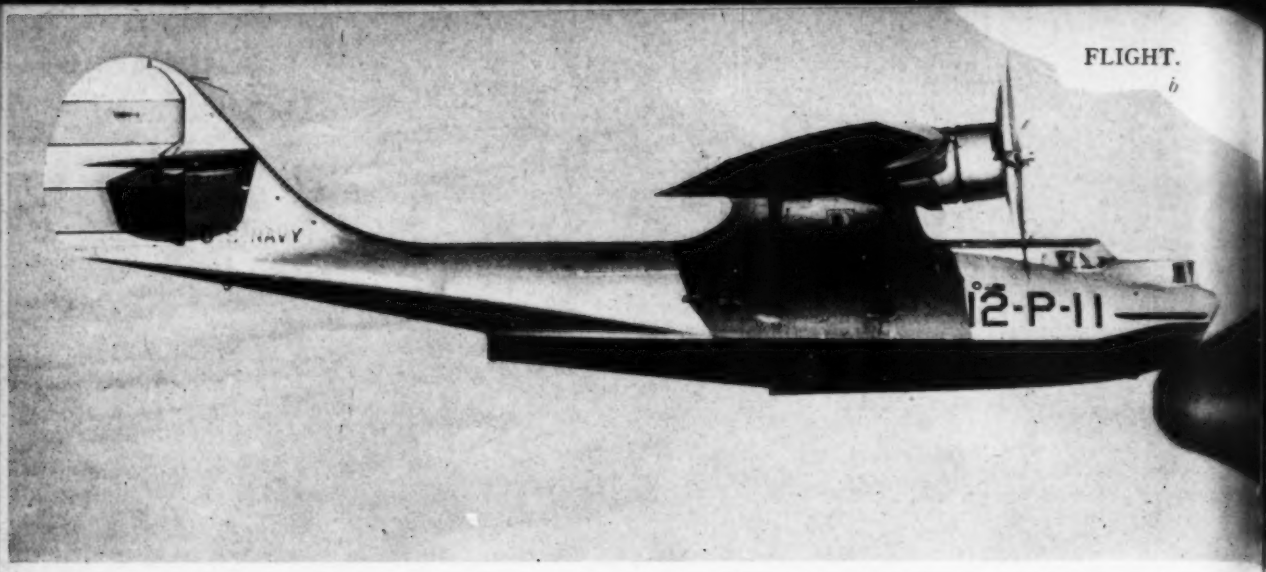
Other Boeing activities have been the completion and testing of the new 155-foot XB-15 bomber and the handing over of the machine to the U.S. Army Air Corps. Then there are six big 152-foot Boeing flying boats in the making; one is almost ready to have its engines mounted.

Incidentally, a Boeing 307 landplane is being built for Capt. George Whittel for his own private use, and when it is completed he will receive a bill for 300,000 dollars.

Recently Sikorsky launched for the U.S. Naval Air Service a giant airboat known as the XPBS-1, and it is now before the Navy Board of Inspection and Survey for acceptance trials.

The Glenn L. Martin factory has "test-hopped" its latest creation, a 157-foot flying boat built for the U.S.S.R. (see *Flight*, December 16). This is an enlarged version of Martin's famous *China Clipper*, the most noticeable change being the use of two rudders.

But that is briefly the picture of the outsize airplane as it is to-day in America. Though the designs are many and varied, the aircraft companies have not contented themselves by concentrating their efforts solely on such



A Consolidated PBY patrol bomber (two 850 h.p. Pratt and Whitney Twin Wasps) of the U.S. Navy. This machine is one of the most successful of its type ever built.

types. On the contrary—and here is the big news—the Glenn L. Martin Company, now one of America's largest exporters of aircraft—is reported to be spending some time in the development of 60-ton patrol flying boats for the Navy, as are, reportedly, Boeing and Sikorsky. The Navy recently announced to the public that Martin was sole bidder on fourteen patrol boats at a cost of approximately 150,000 dollars (£30,000) each. However, Martin's biggest venture seems to be the new flying boat for trans-oceanic service. The design of the plane has been completed and construction begun! It will top Boeing's ships by many feet, having a span of 188ft. A hundred passengers will be carried by day and sixty-six by night. It will be the largest airplane built in the United States. The cruising range will be such that the plane will be able to span the Pacific ocean non-stop if the necessity arises.

"Seawings" Abandoned

Four engines will be mounted in the leading edge of the full cantilever wing. It is expected that wing floats will be installed instead of the sponsons used on former Martins and the forthcoming Boeings. The wing is faired into the top of the hull, and the tail is of the twin-rudder type. Most interesting in design, however, is the hull, which is of what might be called "tear drop" design. Lacking the so-called bow, it has a very blunt nose like that of the new Boeing 307 transport. As the hull tapers aft, a vee-bottom gradually takes shape. The pilots are stationed in the extreme nose of the hull.

It is not a secret that Sikorsky has for some time been working on a commercial flying boat in the 50-ton class. Mr. Sikorsky's idea of next year's flying boat is that there will be two decks and a control "bridge," 12 by 15ft., with seats for pilot and co-pilot, and a large desk, 4ft. by 6ft., for navigation charts. To the rear will be the radio compartment, and below decks the automatic pilot. It may be necessary to use mechanical power to move the controls, because of the huge proportions of the surfaces. Under trans-Atlantic conditions about thirty-six passengers will be carried, with fuel for a 4,500-mile range. It will have a 16ft. by 16ft. dining-room, to be used also as a lounge and for dancing. Mechanics may walk through the wing and inspect the engines while in flight.

The Consolidated Aircraft Corps has constructed a four-engined flying boat for the Navy. It resembles the Sikorsky XPBS-1, but has retractable wing-tip floats.

In the land transport field Douglas and Boeing almost literally "hold the bag," and we are not apt to find much activity elsewhere. There is one big item, though that has gone almost entirely unnoticed, and that is the machine being built in secret at Curtiss-Wright's St. Louis plant. We mentioned earlier in this article that Curtiss-Wright had been at work on a four-engined transport. It is the writer's belief that this aircraft, now well under way, is the "mystery" one, probably with improvements in design intended to surpass the features of the Boeing and Douglas developments. The new machine will have four engines and a nose-wheel, and is designed for the sub-stratosphere for altitudes even higher than the Boeings will go.

The Army Air Corps and T.W.A. have experimented extensively at high altitudes, and more recently Pan-American have equipped Douglas D.C.3 transports for such flights. The Army has used, among other aircraft, a specially built Lockheed, while Glenn L. Martin has explored the field more from the theoretical side. While these tests have been run up to 45,000ft., the forthcoming Boeing 307-S will probably not go any higher than 25,000ft., where a cruis-

Air Corps officials inspecting the Fowler flaps on the Lockheed 14 (or Sky Zephyr) transport.

The new Consolidated XPB2Y-I patrol bomber (four Twin Wasps) recently completed. This machine is in competition with a Sikorsky boat with similar characteristics.

ing speed (75 per cent. throttle) of 270 m.p.h. will be obtained. It will perhaps be the Curtiss-Wright transport that will take the next step into thinner air.

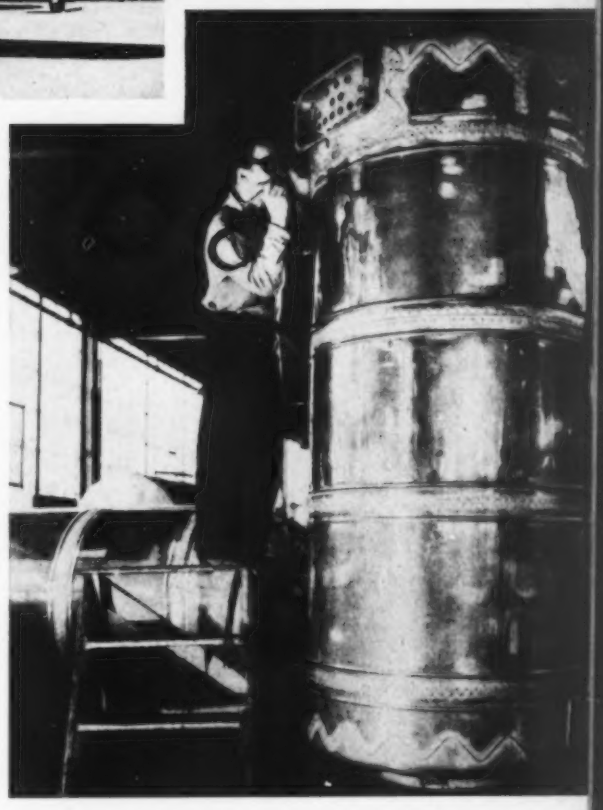
While on the subject of stratosphere flying we must not neglect to mention the most recent endeavour. A well-known pilot, none other than Jimmie Doolittle, has taken delivery of a new two-place Seversky for experiments between 25,000 and 30,000ft., to determine fuel consumption and reaction under high-altitude conditions. The Shell Petroleum Co. is the sponsor. Estimated top speed is 350 m.p.h. at 30,000ft., using 100-octane fuel. The ship is similar to Frank Fuller's Bendix-winning Seversky, with a compartment in the rear for a passenger. Other recent Seversky developments are a Navy fighter and a two-seater fighter for export.

A Seversky "Twin"?

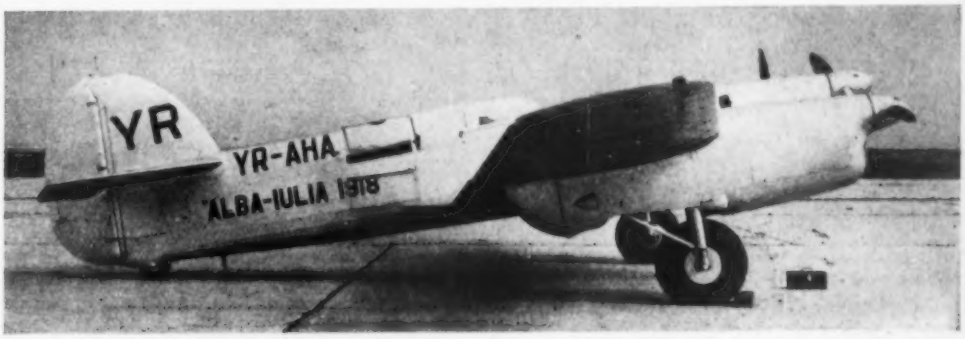
It is rumoured that Seversky is working on a twin-engined ship with wing panels that retract about 8oin. each for high-speed flying. Fleetwings, Inc., are now building a stainless-steel wing for a Seversky pursuit. Other Service types are a mid-wing seaplane Vought fighter, and the new Douglas torpedo machines and Northrop dive bombers now being completed rapidly for the U.S. Navy.

While the latest Bellanca racer is being made ready at Floyd Bennett Field, Brooklyn, N.Y., by Alexis Papana for his flight to Rumania, two new Bellancas are being built. One will be a single-engined, low-wing, all-metal, full cantilever monoplane, and the other a twin-engined, low-wing monoplane that will sell for less than 10,000 dollars (£2,000). Bellanca have been very successful in keeping details of these machines secret, as have Fairchild, with their new large sportplane. Perhaps there will be a wheel in its nose and Fowler flaps.

Getting away from the flurry of all-metal design are two new ships all set to take their maiden flights. They are Vance Breese's and Allan Lougheed's twin-engined low-wing efforts. Both are of all-wood construction with single-spar full-cantilever wings. Vance Breese's ship is being built by the Bennett Aircraft Corp. in Hawley Bowlus's sailplane and trailer shop. Mr. Breese is one of the better-known American test pilots as well as being an engineer, his most publicised achievement being a spec-



A tank for the first of the Boeing Clippers (four 1,500 h.p. two-row Cyclones) now under construction for trans-oceanic work.



The special Bellanca built for the Rumanian Captain Alexis Papana for a transatlantic flight. The nose engine is a Fairchild Ranger inverted vee and the outboard units are six-in-line Menascos.

tacular power dive in a Northrop in which his entire body was taped, so he would still be in his right mind and health after pulling abruptly out of the dive. The new Bennett has conventional lines and about the same capacity as the Lockheed 12.

Alan Lougheed's development has plywood covering which gives it a very smooth outer surface. The unconventional feature of this new ship—a development of the Alcor—is that its two 250 h.p. Menasco engines will be laid on their sides opposite each other in the nose of the fuselage, giving very little frontal area and bringing the airscrews very close together to minimise yaw should single-motor flying be necessary.

While on the subject of opposed placing of engines, there is another company in the United States working on a similar scheme with two Menasco units; in this case, however, they will be geared to a single airscrew. (Larry Brown, race plane designer, has also been considering the same scheme.) The concern in question is known as the Airover Company and is said to be a subsidiary of the Lockheed Aircraft Corps (no longer associated with Allan Lougheed). Mac Short, formerly chief exponent of the Stearman concern, has joined forces with this new company, and several new models will come forth, with the possible inclusion of Lockheed Vega designs brought up to date. A Lockheed Altair is now being equipped with two geared-together Menascos and will be test-flown very soon. Another new model is expected to have a tricycle landing gear with all three wheels completely retractable. The Lockheed company itself will have a tricycle landing gear on its next model.

The Luscombe Method

Mr. Donald Luscombe, aviation promoter of note, has a method, not entirely new, which he will employ in the production of a metal airplane in direct competition with Taylor, Aeronca, and Taylor-Young. Companies specialising in the manufacture of various parts will make the "bits and pieces" for the Luscombe under contract, and they will be assembled by Luscombe's company. Thus excessive expense in manufacturing equipment will be spared and the cost of each part should be appreciably lowered. The new Luscombe will be a two-place, all-metal, high-wing monoplane powered by one of the new 50 h.p. Continental engines which are about to make their first public appearance.

The new light planes now making their début for slightly over 1,000 dollars (£200) could almost be called luxurious. Each day they take a step closer towards the mass production or "volume" stage. Unless some other country takes steps to produce light planes of equal performance and volume, the United States will soon hold the light plane industry in the palm of her hand, as she has the automobile industry. Can anyone refute that statement?

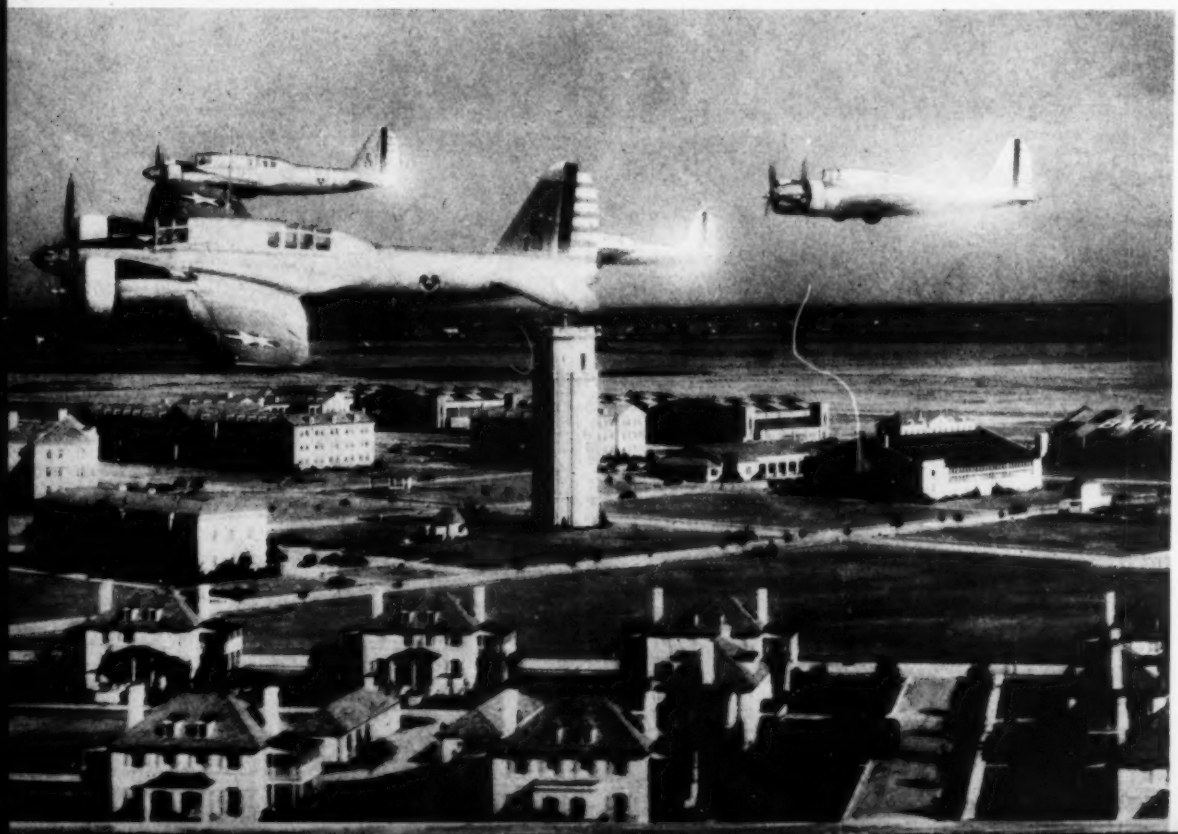
We hear reports that Bill Ong, former race pilot, is building a private airplane, and Roy Hunt is building a specially designed stunt plane for the National Air Race. Lockheed is designing the Model 16 with Fowler flaps.

The Timm Transport

Another unique airplane that will take-off almost on the very day that Vance Breese and Allan Lougheed test theirs is the Timm 840 twin-engined, high-wing, six-place transport. The Timm Aircraft Corporation constructed a small, cosy drafting room next door to their spacious shops and, with seven engineers under the direction of Mr. Otto Timm, have perfected their new ship. Timm is one of the largest companies in the U.S. specialising in the repair and alteration of aircraft. Thus the construction of their new plane has been more or less a "filler-in" to keep their large crew of mechanics busy when there is not an overwhelming supply of broken airplanes to be repaired. Construction of the Timm 840 has been rapid, in spite of the fact that it had to be halted one month when the entire plant crew had to be employed on a rush job to instal fuel tanks with a total capacity of 1,000 gallons in Jimmie Mattern's Lockheed which was flown in the vicinity of the North Pole in quest of the lost Russians. Mattern will shortly fly across the Pole to Russia. Incidentally, a similar craft was purchased by Joe Thorne, noted auto race driver, for use in the cancelled New York-Paris race. It is possible that Thorne may make some other spectacular flight in its stead.

The Timm company has requested that no mention should be made of details of their airplane at this time, though we can say that Handley Page slots and flaps and a tricycle landing gear are employed, while the nose wheel is hydraulically steerable. Construction is a unique combination of steel tubing and wood. The top speed is about 210 m.p.h.

Curtiss A-18 attack machines (two Cyclone Gs) in service test with the U.S. Army Air Corps. These machines are intended to replace the single-engined machines now in use.



Howard Hughes's engineering consulting staff has been working on the modernisation of the Driggs Skylark, now known as the Western Pirate. Thousands of old parts made in 1929 for planes that were not assembled are being used.

Test flights have been conducted on the West Coast by Howard Hughes with his latest "flying gas tank"—a Sikorsky S-43 that is being prepared for some spectacular flight. The ship is more or less standard except that the hull is one huge fuel tank with room for pilot and co-pilot. Further aft is a small compartment for the radio operator. Recently the best in radio and navigation equipment was installed at very great expense. The Hughes S-43 is perhaps the most complete long-distance airplane ever built.

Now that the Lockheed 14 transport has been given its A.T.C. approval there is no possibility of doubt that the Fowler flaps incorporated are successful. They have been so successful, in fact, that the whole aspect of aircraft design will change. Why use split flaps when you can now use Fowler flaps? If one is able to increase a plane's wing loading to 27 lb./sq. ft. on a small ship like the "14," imagine what can be done on larger airplanes, such as the proposed new flying boats. Many engineers have been working on the design of huge boats which, they say, will be so large that they will land at about 150 m.p.h. with safety. Increasing the wing loading on these boats so they would still land at 150 m.p.h. with Fowler flaps would really be the keynote to efficiency. That is something yet to come when engines are developed for such giants.

What Youth Wants to See

AIRCRAFT take a foremost part at the Schoolboys' Exhibition now open at the Imperial Institute, South Kensington.

Petrol-powered and rubber-driven models, and super-detailed wood and metal scale models, are to be seen in large numbers.

The *pièce de résistance* is undoubtedly an actual Gloster Gladiator, with covers and fairings removed to expose the "works." Small pushes on a panel light up nameplates on essential parts, and close-up inspection of every section is permitted. Other switches, on panels nearby, illuminate on large maps the air routes of the British Isles, all fighter or bomber squadron aerodromes, the progress of the Saro Londons to Australia, etc.

The Navy's exhibit includes a fine scale model of *H.M.S. Ajax* carrying catapult gear and its complement of Hawker Ospreys. Imperial Airways are represented, Short Empire boats and A.W. Ensign machines being depicted in models and photographs. There are a good many photographs of aeronautical interest to be seen on various stands.

The Exhibition opens at 11 a.m. each weekday and continues until next Saturday.

Assorted Adventure

"Freelance Pilot," by Norman Macmillan (William Heinemann, Ltd., 15s. net).

A MAN who is an air pilot (and of the test-pilot class), a bit of a philosopher, and an accomplished writer, is equipped for life with more than is bestowed on most mortals. He certainly ought to enjoy himself; and, being a writer, he is able to give no little pleasure to others.

Capt. Norman Macmillan, M.C., A.F.C., has already given much enjoyment to the readers of his book *Into the Blue*, in which he told the story of his experiences as a fighter pilot during the war. Now he has carried on his autobiography with an account of his doings in the years just after the Armistice. He ferried aeroplanes to Spain, he watched a battle in Spanish Morocco from the Spanish firing line, and he acted as instructor to the Spanish Flying Corps.

Then he joined with Major Blake and Mr. Malins in an attempt to fly round the world. The attempt ended with Blake in hospital in Calcutta and Macmillan and Malins stranded for nearly a week on a foundered seaplane in the Bay of Bengal. The story was told vividly at the time in a cable written in the hospital at Chittagong, and it is here told again in greater detail.

It is strange that the tale of a flight made fifteen years ago should have such interest in these days when adventurous, and mostly successful, flights are now so common, but so it is. This book simply grips the reader. That is due to the wizardry of Capt. Macmillan's pen.

Retirement of George Hawkins

THERE must be very few people in the British aircraft industry who have not at some time or other come into contact with Mr. George H. Hawkins, advertisement manager of *Flight*. To Mr. Hawkins, with Mr. Stanley Spooner, fell the task of launching this journal nearly thirty years ago.

When *Flight* began publication in 1909 there was practically no British aircraft industry, and there were many who did not hesitate to tell Mr. Spooner that he was wasting his time and money on a forlorn hope. Neither lost faith, however, and time has proved their optimism justified.

After a period of twenty-nine years Mr. George Hawkins has relinquished his post, failing health having rendered retirement and rest imperative. He will carry with him in his retirement the good wishes not only of the members of our own staff but of all those in the industry with whom he has come in contact during his long association with this journal.

The post of advertisement manager of *Flight* has been taken over by Mr. B. G. Wootton, who has assisted Mr. Hawkins since 1934.

NEW YEAR HONOURS and AWARDS

THE names of those connected with Aviation who have been honoured in the New Year's List are not great in number, but many of them are already distinguished in various aeronautical spheres. The names appear below.

HONOURS

VISCOUNT

William Richard, Baron Nuffield, O.B.E., D.C.L.

ORDER OF THE BATH

K.C.B. (Military)—Air Marshal William Gore Sutherland Mitchell, C.B., C.B.E., D.S.O., M.C., A.F.C., R.A.F.

C.B. (Military)—A.V.M. John Eustace Arthur Baldwin, D.S.O., O.B.E., R.A.F.

C.B. (Civil)—Albert Henry Self, Second Deputy Secretary, Air Ministry.

ORDER OF THE INDIAN EMPIRE

C.I.E.—Group Capt. Malcolm Henderson, D.S.O., R.A.F., lately O.C. Aircraft Depot, Karachi.

ORDER OF THE BRITISH EMPIRE

C.B.E. (Military).—Group Capt. Frank Hubert McNamara, V.C., R.A.A.F.

M.B.E. (Military). Q.-M. (Hon. Flt. Lt.) Leslie Griffiths Carter, R.A.A.F.; W.O. Cl.1.; Sydney Alexander Noble, R.N.Z.A.F.

O.B.E.—Adam Henry Robson, M.C., M.Sc., Ph.D., Principal Educational Officer, Air Ministry.

ROYAL RED CROSS

A.R.R.C.—Miss Grace Elsie Margaret Clubb, Senior Sister, P.M.R.A.F.N.S.

AWARDS

Air Force Cross.—Sqn. Ldr. Arthur William Baynes McDonald; Sqn. Ldr. Francis Victor Beamish; Sqn. Ldr. Wilfred Leslie Freebody; Flt. Lt. (Lt. Cmdr., R.N.) Ian Ross Grant; Sqn. Ldr. Arthur George Loton (R.A.F.O.); F/O. Arthur Edmond Clouston (R.A.F.O.).

Air Force Medal.—Flt. Sgt. Jack Rawlinson; Flt. Sgt. Jack Williamson.

COMMERCIAL AVIATION

THE WEEK AT CROYDON

Ground Transport Problems : Penny Wise : New Year Jollity by W. & B. : A Booking Conference : Ice and All That

DURING the brief period of the strike in Paris, a passenger by British Airways took 1 hr. 30 min. to reach Le Bourget from the centre of the city and only 1 hr. 20 min. to reach Croydon from Le Bourget. Ground transport is rapidly falling behind in the race, for with a following wind a fast machine from Paris or Rotterdam will make the journey in these days almost as fast as the road trip from Croydon to London can be made.

Clever people, including those who try to make aeroplane arrivals synchronise with those of trains which won't wait, pop up from time to time with sovereign remedies. Others, like the L.C.C., produce wonderful schemes whereby passengers, if and when they arrive at an almost permanently fog-bound airport, are to use the Underground, which they point out, is fog-free and unaffected by traffic lights designed to turn red at the approach of an air-passenger coach. There is, however, one tiny fly in the ointment (which actually looms as large as an albatross in the bath) to the airline operator, who, according to commercial usage, was naturally not consulted in advance. Luggage, following some troglodytic tradition, may not be carried by Underground. Any traffic man will tell you that it is easier and more peaceful to skin a live and aggressive wildcat with an wholly unsuitable blunt instrument than to part a passenger from his luggage. Besides, what shall it profit a man to hurtle through the bowels of the earth in ten minutes and then kick his heels for twenty in synthetic marble halls waiting for his baggage to arrive by road, especially if this pause means missing an important train connection? So long as people gaily embark on £600,000 airport schemes in fog areas, or find, after considerable boasting, that the whole place becomes an area of marshland, poor old Croydon, despite its numerous disadvantages, will probably hold its own.

Might Have Been

Very many of Croydon's snags, by the way, could have been remedied if the authorities had taken the steps they were urged and implored to take years ago. There need have been no overcrowding in the offices, in customs accommodation, in car parking nor in the hangars as there is to-day. Right from the start "penny wise, pound foolish" has been the motto and a miserable patchwork has been the result. About overcrowded hangars, a leading newspaper writes: "So far no new hangar is being built, no decision to build one appears to have been taken and no building enterprise begun now can possibly be finished in time to meet the new demands as they present themselves in the form of new airliners."

With the above one can disagree only on the point that there are no *new demands*, but old ones which have repeatedly been placed before the authorities, for everyone could see what was coming, except those who should have seen it most clearly—that is, those responsible for arranging for the future. The same newspaper says that the Air Ministry agrees that accommodation is "much overtaxed" and confesses that no decision (ever) has been made as to the measures which must be adopted. One theory is that the authorities are so very very far-seeing that they scorn to look less than fifty years ahead and thus do not cater for the immediate future. Being unable to legislate for what may happen half a century ahead, their policy of complete inertia is entirely logical.

Perhaps the B.B.C., when broadcasting in various languages to tell the world we are neither so degenerate nor so incompetent as certain fat, little, rostrum-mounted men in funny hats would have people believe, will have a crack at explaining the odd situation whereby large civil aircraft will shortly have to be parked on the footpaths at each side of Purley Way for lack of hangar accommodation at what we proudly term the London Terminal Airport.

Not Amused

There's nothing like starting the New Year with a hearty gust of laughter, thus ridding the lungs of residual air, vintage 1937. The other day, during QBI, which nowadays is our normal state, a large aeroplane tightly packed with passengers eager to leave Croydon, suffered considerable delay on the tarmac, waiting for another aeroplane to get down. The traffic boss responsible for his firm's punctuality record, to whom minutes seemed hours, at last so far forgot the seasonal motto, "Peace on earth and all that," as to yell up to the control tower (sarcastic like), "Is Fred Karno there?" An earnest foreigner (with special pass to view the tower) was on the balcony. Ever anxious to help, he rushed into the tower and asked the officer on duty, "Is Fred Karno present?" To this day he fails to understand the bleached and icy stare which he received, thus turning the fancy bow tie he was wearing into a perfectly good gent's snow-white dress ditto.

I am informed that a meeting was recently held at the Air Ministry, all companies, British and foreign, being invited, to discuss the layout of contact lighting to be installed along the axis of the radio beam at Croydon. So, after all, you see, the Air Ministry, apart from housing problems of men and machines, is doing the necessary in the vital questions of safety—which is certainly the main thing.

From a written answer to a question in the House, I see that Croydon only fell short in 1936 by £2,000 in paying its way. It is a sad thought that if the place had only been properly built to start with it would now be a paying proposition, presumably, for it must cost the Air Ministry a packet to maintain. Even as I write, what little daylight one gets at this time of year is obscured by platforms and scaffolding outside my window. Great fun is had by a small army of workmen dropping heavy hammers and lightweight bricklayers' mates through glass roofs beneath which people congregate for shelter, and now that the scaffolding runs all round the buildings merry games of tiggy-

tiggy touchwood will doubtless be organised by Works and Bricks. Some say that these games are not the real defect of the scaffolding, but that repointing is being done. But when a building is made of blocks of porous pumice stone, why repoint it? Anyway, we all hope nobody will interfere with the dark corner of the main hall where the stalactites are, and where the botanically minded may find rare moisture-loving ferns and mosses. They say a couple of shy tadpoles live there, known affectionately as Works and Bricks, but for this I cannot vouch.

A very excellent step in the right direction is being made next March, when a Booking Conference will be held in The Hague, to which representatives of all the big companies will be invited. I believe the scheme is to get preliminary ideas from the men who actually do the job—one of the most complicated in existence—of booking along the increasingly intricate network of air lines. Chief booking clerks really know what is wanted, and, after listening to them, the heads can go to the I.A.T.A. conference with suggestions which will be of practical value to everybody.

There is a lot of silly season talk in the lay Press (there being no close season for damfool yarns in modern newspaper work) about ice formation, of which there are half a dozen kinds; some look formidable and are not, and others are unspectacular but really very dangerous. One day recently every machine landing at Croydon was what Sam Weller (referring to Mr. Pickwick's bedroom jug) called a "mask of hice" but there was no harm in it. Most pilots flying fast, all-metal machines prefer to do without any sort of paste, which, whatever its anti-icing virtues, gives a rough surface. They say that judicious flying, plus the anti-icing qualities of very highly polished surfaces, will keep them comparatively free from ice on most days, and if not then the best place is on the ground. Others, mostly flying fabric-covered or partially fabric-covered machines, think no small beer of anti-icing compounds, and there you are. I merely record casual conversations and make no comment.

One of our brightest cynics has suggested that some local fishmonger should bring a van to the airport and collect the lumps of ice off air-liner wings. But things are not as bad as that from the pilot's point of view—or as good from the fishmongering outlook.

A. VIATOR.

The French . . . .

THE Minister for Air in France has granted the first payment of credit for the layout of a flying-boat base on the lake of Biscarosse. This marine airport will, presumably, be used by the machines making trial flights over the North Atlantic during 1938.

. . . . and the Italian Atlantic

FOLLOWING his record-breaking flight to Rio de Janiero Signor Stoppani is reported to have said that this flight was preparatory to the development of a regular Italian passenger and mail service to South America—the suggested route being by way of Cadiz, Senegal, Cape Verde Islands and Natal. During January it is expected that three land machines will leave Rome and fly by stages to Buenos Aires.

Meanwhile, the British Airways survey party has arrived at Lisbon on its return from West Africa where the representatives have been investigating technical and operational problems concerning the projected British West African and South Atlantic service.

The Airports Conference

THIS year the Airports Conference will be held in London between January 19 and 21 inclusive. Organised by the Aerodrome Owners' Association, which works under the auspices of the S.B.A.C., and had its origin in a revival of the Air Transport Section in 1934, the Conference will be attended by some ninety delegates, including representatives from twenty-three municipal authorities.

On Wednesday, January 19, at 2.30 p.m., the Conference, which will be held at the headquarters of the Federation of British Industries (21, Tothill Street, London, S.W.1), will be officially opened by Col. Sir Francis Shelmerdine, the Director-General of Civil Aviation. The morning will be utilised in the discussion of private business; in the afternoon the delegates will consider a report on the work of the Association during 1937; and in the evening the annual banquet will be held at Grosvenor House.

On the following day, January 20, three papers will be read and discussed. These will be: "Practical Aspects of Aerodrome Management," by Mr. M. H. Volk; "Grass Drying on Aerodromes," by Mr. H. Mitchell Usher; and one dealing with more general problems of civil aviation organisation by Mr. R. Ashley Hall. Finally, on January 21, the delegates will visit Short Bros. to see the building of the Empire boats.

Jersey Affairs

IN order better to suit the requirements of passengers, Jersey Airways' winter time-table was slightly modified on January 1. Passengers now leave Victoria Station at 12.30 p.m. and St. Helier at 11 a.m., the latter time permitting connection with the steamers from Guernsey.

Incidentally, in last week's issue a sentence concerning the Jersey services might have given the impression that the new airport on the island was owned or controlled by Jersey Airways. Needless to say, this airport was laid out and is owned by the States of Jersey—in other words the Government of the island. The radio station is administered by the Committee of Piers and Harbours, who occupy a similar position in air matters in Jersey as the Air Ministry does over here. The airport is, of course, fully open to international air traffic.

Turkish Extensions

CONSIDERABLE extensions to Turkish air services have been announced. After the end of April, the following internal routes will be covered regularly: Istanbul-Izmir, Istanbul-Adana, Izmir-Adana, Izmir-Ankara, and Ankara-Adana. Those services already being run will, of course, be maintained. In addition, new connections will be made with centres outside the country and the following routes will be covered: Ankara-Belgrade, Ankara-Athens and Ankara-Bucharest. A line to Teheran is also planned. The machines used are D.H.86Bs and 89As—four of each. A D.H.90 Dragonfly is also in service—mainly for twin-engined training—with a fully-equipped Tiger Moth for blind-flying training.

LIGHT TRANSPORT—1938 MODEL: The new Potez 66 which is estimated to be capable of 200 m.p.h. with four 220 h.p. Renault 6Qs (Model 661) or 290 m.p.h. with the new Gnome Rhone 14M small-diameter radials (Model 662).

Commercial Aviation

TRANSPORT COMPARISONS

How the Airline Operator Might Choose His Fleet : Some New Ideas in the Economics of Air Transport

By R. A. E. LUARD

AT the aircraft shows which have been held this year all over Europe there has been a smaller collection than ever of commercial aircraft, and their types and uses have shown little tendency to develop so as to supply an answer to every need.

We all know that there are reasons for this. Military expansion has displaced commercial aviation's needs for the moment. Airline operators are still losing money or are tied to subsidies and so are not attractive as customers, having little money to spend. These are only passing phases in the development of aviation. If there is no war in the near future, military expansion will slacken its rate. This will deprive the aircraft industry of by far the largest part of its market as things are at present, and the industry, forced in the hothouse of rearmament programmes, will be badly nipped unless new outlets for its potential energy can be found. The civil market and, in particular, the commercial operators' section, will afford a partial outlet.

Once the industry is constrained to give its attention to the civil market, the range of aircraft types should increase, so that different types will be built for various specific uses. This will mean that once an operator has determined what the nature and capacity of his operations will be, and, therefore, also the type of aircraft required, he will be able to turn to a variety of makes.

At the moment the prospective aircraft purchaser has no great field of choice and usually must base his decision on questions of delivery dates or some other such point quite unrelated to the efficiency of the machine or the economics of its purchase.

It is unlikely that the prospective aircraft purchaser will ever have such a big field of choice as the motor purchaser, but the field is bound to increase. Once it has so increased, each type in the required class can be taken in turn and costed in detail for the proposed route. Obviously, there is little difficulty in determining the efficiency of various aircraft of exactly similar character and performance relative to a particular route where all the requirements and details bearing on the organisation and on the running costs are known, for full comparative estimates can be made. The real difficulty arises where comparisons of efficiency and economy are sought without full comparative estimates of costs and where the machines concerned are not exactly similar in capacity and performance.

It is extraordinary what a variety of answers will be received if this question of "how to choose" is put to operators. Rarely will anybody give a satisfactory answer.

Evidently there are other grounds for the choice of an air transport machine than pure efficiency figures of load and any other such formulæ. These other factors cannot be brought into a figure comparison and must be computed by other means. Of such factors, reliability, safety and passenger comfort are the most important.

Before even considering these other factors it is submitted that the first comparison should be made on figures. Arguments may be justly levelled against such a method where an industry is young, as reliability is then at a premium. The motor trade passed through such a stage. The aircraft industry has just emerged, so that such arguments cannot now be made to apply. What figures then can be taken for comparison ?

This question cannot be answered until the purchaser and his needs have been defined. The purchaser considered here is the airline operator. He must know the capacity he is going to provide on the route and the service he proposes to offer. A comparative table has been drawn up to show how these two cardinal points, capacity and service as measured on a common basis of efficiency, are provided by aircraft of widely different types. The types actually chosen for the purpose have been picked indiscriminately; they are confined to English and American makes of tried design since figures for these were available. It is stressed, however, that the table represents a general formula, and that any aircraft may be analysed in this way whatever the make and whatever the type. The prices for the American aircraft have been omitted as these would have to be altered by addition of variable allowances for import dues, exchange rates and shipping costs.

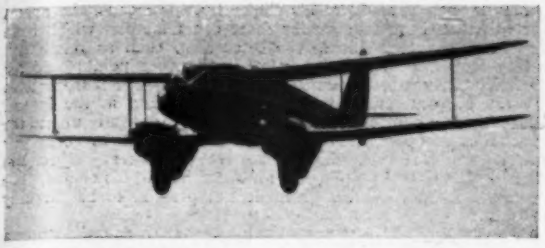
COMPARATIVE TABLE OF EFFICIENCY.

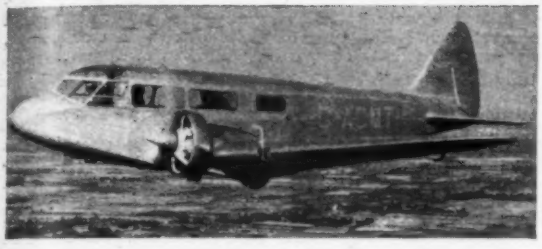
Machines (in order of size).	Monospar ST25.	B.A. Double Eagle.	D.H.90 Dragonfly.	D.H.89A Rapide.	Beechcraft 18.	Airspeed Series III.	Lockheed 12.	Lockheed 10A Electra.	D.H.86A Express Airliner.	Douglas D.C.3.	Short Empire Boat.
Engine	2 Pobjoy Niagara III.	2 Gipsy Major.	2 Gipsy Major.	2 Gipsy Six I.	2 Wright Whirlwind R.760E-2.	2 Jacobs L-5.	2 Pratt & Whitney Wasp Jun. S.B.	2 Pratt & Whitney Wasp Jun. S.B.	4 Gipsy Six II (v.p. airscrews).	2 Wright Cyclone.	4 Pegasus X.C.
Disposable load, in lb. ...	1,117	1,400	1,530	2,270	2,400	2,597	2,735	3,775	4,540	8,700	16,650
Disposable load as % of all-up weight	38.5	39.0	38.0	41.0	37.0	39.0	32.5	37.5	41.0	36.2	40.5
Cruising H.P. as % of maximum H.P. ..	73	74	85	65	65	64	75	75	75	70	56
Cruising speed in m.p.h.	111	145	125	132	192	155	213	195	160	188	160
Disposable load in lb./cruising H.P.	8.0	7.4	7.0	8.7	5.7	6.9	4.5	6.3	7.6	7.0	8.2
Fuel consumption in gallons per ton/mile disposable load	.195	.149	.140	.134	.139	.134	.200	.158	.124	.097	.114
No. of passenger seats ...	4	5	4	6	8	6	6	12	12	21	24
Capital cost per passenger seat/miles per hour ...	£4 5s.	£3 16s. 5d.	£5 6s.	£5 10s.	—	£6 5s.	—	—	£5 14s. 10d.	—	£15 4s.
Capital cost per ton/mile disposable load per hr.	£35	£30 12s.	£31	£29 10s.	—	£32 6s.	—	—	£34	—	£49

The basis of the table is very simple, as the only figures used are those of disposable load, cruising speed, cruising horse power, and petrol consumption at cruising speed. It is maintained that these figures are the essentials in any comparison of aircraft efficiency, and yet in most cases they are found with difficulty from among the mass of other details given in every aircraft sales pamphlet.

The top two lines give the make of aircraft and engine. All the types shown are twin-engined and are suitable for various classes of transport work. All figures are estimated as closely as possible, but in some cases information was not exact enough to secure accurate results, so that the figures must be regarded as approximations only.

Take now the first line of figures. These give the disposable load of the various types. The disposable load is here taken as the difference between the all-up weight, fully equipped but without radio, and its weight empty. This figure is taken to show the total capacity of the aircraft; it represents the total weight of which the operator can dispose, so that, within limits, he can determine in what proportions this total shall be filled by the various weights of fuel, passengers,





Two medium-sized types used in the efficiency comparisons—the D.H.89 and the Airspeed Envoy. The latter is "fitted," for the purposes of the article, with Jacobs engines.

pilots, luggage and freight. By this means the elastic figure of payload, which is the proportion of the disposable load not accounted for by fuel and crew, is avoided, for, the amounts of fuel being variable indefinitely within the maximum capacity provided, there never can be a satisfactory payload figure without reference to a particular distance.

The next line of figures shows the percentage of the disposable load to the all-up weight of each machine. This is, in effect, the weight for weight ratio, so that the nearer the figure is to the 50 per cent. mark the more efficient is the design from the load-carrying point of view, as at 50 per cent. it would, as it were, be carrying its own weight. It is interesting to note how small the mean variation is between the maximum and minimum in these figures.

The next two lines are self-evident, but there is a difficulty in securing a uniform basis, as the different types have different optimum operational heights. Naturally, too, the machine can always be throttled back and this would affect the whole series of figures following below. It must be assumed, therefore, that the cruising speeds suggested by the makers, and given here as a percentage of the maximum horse-power, are those at which the various machines are best operated. This question of cruising horse-power seems to have little attention given to it in the usual sales literature, yet it is an important figure as it must react directly upon running costs.

Below is a line which shows the disposable load (defined above) in lbs. carried per horse-power used at cruising speed. This again gives a certain indication of design efficiency, and it should, of course, be read in conjunction with the cruising-speed figures. Take, for instance, the DH.89 A Rapide's figure of 8.7 lb./h.p., and compare it with the 6.9 lb./h.p. of the Airspeed Series III. At first sight the latter appears at a disadvantage, but reference to the cruising speeds will show the former as 132 m.p.h. and the latter as 155 m.p.h. Com-

One of British Airways' Lockheed Electras.

***Canopus*, the first of the Short Empire boats for Imperial Airways.**

pare the Airspeed's 155 m.p.h. and 6.9 lb/h.p. with the D.H.86 A's 160 m.p.h. and 7.6 lb/h.p., and on this basis the advantage goes to the D.H.86.

Turn now from efficiency to economy. Here, again, the payload figure is substituted by that for disposable load and the unit of load carried is reckoned in ton/miles per hour. The resulting figure is the amount of petrol required in each case to carry a ton of disposable load over one mile for the machine in question at its given cruising speed. A load figure is taken instead of the more usual passenger-seat figure, as reflecting more accurately the differences in capacity of the various types.

For instance, the D.H.89 and the Airspeed Envoy each has the same consumption figure and the same seating capacity, but the disposable load is in favour of the Airspeed. Compare next the D.H.86 A and it is seen that the consumption for the latter is smaller, with double the seating capacity and disposable load. This is no startling result nor one that detracts from the interests of the comparative table, as it merely illustrates the obvious fact that the economy of operation when related to load increases with the size of the aircraft.

This fact, of course, is clearer still in the case of the larger machines, such as the D.C.3 and Short Empire boat. Between these last two it is interesting to note the economy in operation secured by two engines as opposed to four, even though the four are well throttled back. In such a comparison, of course, considerations of extra reliability and safety must be taken into account.

The line below gives the number of passenger seats. This appears always to be a misleading criterion of capacity, as the cubic capacity allowed per person varies as well as the space for baggage and lavatory accommodation. However, it is relevant when considering the next line of figures.

Cost-Efficiency-Capacity

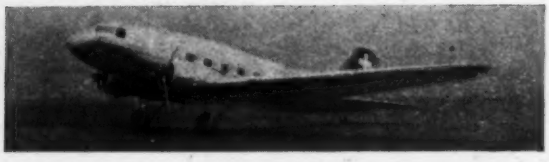
These last two lines were included to take into consideration the first capital cost in its relation to the efficiency and capacity of the different machines. Thus the first line shows the capital cost per passenger seat/mile per hour. The passenger seat/mile per hour figure is derived by multiplying the number of passenger seats by the number of miles covered by the machine at its given cruising speed in one hour's flight, and this figure is divided into the capital cost to obtain a unit price. Naturally, a fixed period or distance must be taken to secure such a figure, and an hourly basis is adopted, since this makes allowance in the formula for the speed efficiency of the aircraft. Compare here the D.H.89 A. and the Airspeed III, and the lowest figure shows in favour of the former.

But, as mentioned before, the passenger seat basis is unreliable, and is shown to be so in this case, for, in fact, the Airspeed III has luggage space and a lavatory, while the D.H.89 only offers the two as alternatives when the layout of accommodation provides for six seats, so that the load figure is always to be preferred. Turning to the D.H.86 A the table shows that there is no great difference in capital cost on a passenger-seat basis with the D.H.89 A, and that on this basis the D.H.86 is actually cheaper than the Airspeed.

The last line deals again with the capital cost, but on a load basis which is exactly the same as that taken for the fuel consumption figure, but for a fixed period of one hour's flight. Turning again to the D.H.89 and the Airspeed, the figures appear lower for the former, but the difference in favour of the D.H.86 on the passenger-seat basis in the line above, as compared with the Airspeed, disappears. It seems, therefore, that although the running cost on a load basis decreases with the size of the machine, the capital cost on the same basis does not necessarily decrease.

Once the capacity and service to be offered on the route has been decided by the operator, the relative merits of various possible types can be estimated on the basis of efficiency and running economy from such a table as that described. Not

Commercial Aviation



A Douglas D.C.3 — actually the first to be delivered to Swissair.

only will he be able to compare machines of roughly similar characteristics without having to reduce each to a uniform range or other common basis, but he will also be able to compare the economy, or otherwise, of operating larger or smaller aircraft, again without altering the basis of the table of comparative figures.

Having narrowed down his choice by this means, the operator will then have to consider those other factors, which have not been forgotten during the discussion, such as reliability, safety factor, passengers' comfort, and other points. Safety and reliability are, of course, prime factors, but reasons have already been advanced to show that now, and in the future, the ultimate choice will more and more depend upon the economics of operation. Moreover, as the press of these new developments is felt, the prospective purchaser will require figures rather than opinions to influence him in his choice. The figures used in the table given do not pretend to be the only criteria.

The table actually represents an attempt to co-ordinate in a common form the widely diverse information supplied in sales pamphlets and to express concisely the essential figures bearing on operational costs in such a way that they can be applied to every conceivable type of machine without modification, and yet give strictly comparable results in every case.

Logical

WHAT is officially known as the "V.H.F. landing approach installation" at Croydon will in future be kept in continuous operation whenever controlled zone regulations are in force. In other words, it is now no longer necessary for pilots to ask that the Lorenz transmitters should be switched on in QBI conditions. Presumably, permission to enter the controlled zone and the allocation of the first landing turn automatically leaves a pilot free to come in either on the beam or on a succession of QDMs, according to his equipment and preferences.

Incidentally, a blind take-off test will shortly be included among those required in the instrument flying regulations for "B" licence applicants.

Two More Records for the "Lieutenant"

THE Latécoère H. 521 (six 650 h.p. Hispanos), better known as Air France's veteran flying boat *Lieutenant de Vaisseau Paris*, is undaunted by the loss last week to the Italian Stoppani of the flying-boat record for distance in a straight line, and has replied by capturing another record from the Italians and by establishing a new one.

She has beaten, by the large margin of 8,000 kg., the previous record of 10,000 kg. for the greatest load carried by a flying boat at an altitude of 6,000ft. This was formerly held by the Italian Cant 508. She has also established a new record by carrying 15,000 kg. at 9,000ft. Italy now holds twenty-two flying boat records, France four and America one —but there are too many of these different records, some of which are quaint to say the least of it.

Something Very Different

ONE of the two Lockheed 12s which have been seen in this country—both privately owned—is at present for sale either as a fast and luxurious private conveyance or as a special charter type. The previous owner, Lord Beaverbrook, has purchased a Grumman amphibian and the recently overhauled "12" has been taken off his hands by Brian Allen Aviation, of Croydon.

Not long ago Joe Birkett and Brian Allen, neither of whom had previously handled the machine, flew it over to Paris in four minutes more than the hour—a time which suggests that the official cruising speed of 214 m.p.h. (on 70 per cent. power) is not far wrong. Thirty-six gallons of fuel were used on the trip.

A Heston Departure

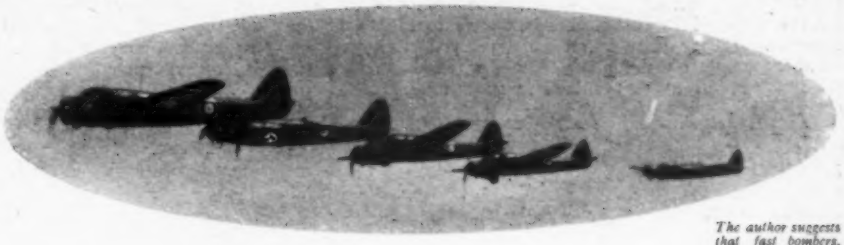
ONE of Heston's older inhabitants in the way of aircraft agency ventures, Malcolm and Farquharson, Ltd., have taken new premises at 302, Bath Road—which, for those who do not know the district too well, is almost opposite Hounslow West Station. They expect, of course, to continue to use Heston as a demonstration centre, and will certainly carry on their business as before.

The idea of transferring the office centre to London was considered, but the final office site was chosen, rather naturally, because they did not wish to be too far away either from their subsidiary factory at Slough or from a suitable aerodrome. M. and F. actually started operations at Heston as long ago as 1934, under their original name of Wrightson Aircraft Sales.

METACENTRIC HEIGHT: Out for its first taxying tests—the Short-Mayo Composite manœuvring under its own power on the Medway last Monday. The extra-large out-board floats of the *Maia* are both in contact with the water, although the main hull does not seem to be unduly submerged.

BOMBING the BOMBER

Giving Raiding Aircraft a Taste of their Own Medicine: A Suggestion for Modernising a Method of 1914-1915



The author suggests that fast bombers, such as Blenheims, could drop "aerial depth-charges" on raiding formations.

By W. MACLANACHAN

ANTI-AIRCRAFT bombing by fighters dates from the early war days, though, excepting perhaps in America, tactics and equipment for this method of attack have not been developed parallel with aerial gunnery. In Air Strategy, *Lieut.-Gen. M. N. Golovine mentions as "an interesting line of development" the use of small bombs against large, or medium-sized aircraft, flying in formation, suggesting that rocket propulsion may be beneficial.*

In the present article Mr. W. MacLanachan ("McScotch") proffers a suggestion with regard to the employment of anti-aircraft bombers *in an emergency as auxiliaries to the fighters.*

THE Air Ministry has consistently maintained that purely defensive measures cannot provide effective air defence and that our aggressive bombers will constitute the major portion of our defence.

In the long run this may be true, for it is undoubtedly essential to obstruct the enemy's supplies as much as possible and to attack his bases. In certain circumstances, however, it may become much more important for us, temporarily, to concentrate on defence proper.

One difficulty with modern air weapons in such a change of tactics is the specialist nature of the machines employed. Although most machines can carry bombs and can therefore be used for "aggressive defence," the bomber machines, except for the light bombers, cannot readily be converted into defensive weapons using the orthodox methods of attack. The R.A.F. has now seventy squadrons of bombers, and before another six months have passed a large proportion of these will be equipped with Blenheims, which is acknowledged to be the fastest bomber in any service.

With this preponderance of efficient aggressive machines it would obviously be an advantage if, in an emergency, they could be used as improvised weapons for defence proper.

Their armament in guns is adequate for their own defence, but in comparison with the performance of a fighter machine, costing much less and carrying only one instead of three or five of a crew, the risk in employing machines of the Blenheim type as fighters, except to avert an absolute calamity, would hardly commend itself to the authorities. The French and Americans have gone farther with their heavily armed multi-seater combat machines, but these are built essentially as fighters and have the necessary equipment of heavy machine guns.

The Suggestion

There is one method in which the Blenheims—and, for that matter, the other fast bombers—could be employed as auxiliaries to the fighters. That is, to use their bomb-carrying capacity to drop what are virtually aerial depth-charges on the attacking bombers.

At heights above 15,000 feet, and most certainly above 18,000 feet, pilots could drop time-fuse bombs on the enemy much more accurately than anti-aircraft guns could hope to fire shells, and from a height above the enemy that would render them reasonably safe from retaliatory fire from the hostile gunners.

There is nothing fantastic in the suggestion that, during daylight, formations of defending bombers can attack and break up raiding formations from a safe height before the latter are attacked by the fighter machines. The actual destruction of the enemy by this method would depend on the enthusiasm, courage and ability of the individual, as would the destroying of a ship or any target that has to be attacked from a low height. The difference would be that with the additional height above that of the enemy and the fact that enemy gunners would have to fire practically vertically (a difficult task in a cramped cockpit), such a method of attack would require the minimum amount of courage to sight accurately on the target. In my own opinion, a height of approximately 1,000 feet would be adequate.

On the technical side, the employment of these tactics need not demand any alteration in the existing equipment, nor would it impair the efficiency of the machines for the purpose for which they were designed. The only additional equipment necessary to convert an aggressive weapon into a purely defensive one would be the supplying of a time-fuse mechanism for the bomb as an alternative to the percussion one, and the adapting of the bomb-sight so that a height of 1,000 feet (or whatever is decided) can be quickly gauged, or the fitting of a special sight for the purpose.

Psychologically, the effect on the enemy would be disconcerting. The detonation of a 56-lb. or 112-lb. bomb within 100 yards is sufficient to make the stoutest pilot swerve and, from a height of 330 yards above an unwieldy formation, there is little likelihood of the error being so great as this. (I shall never forget the effect on myself of the explosion of a six-inch A.A. shell about 150 yards away. I never risked getting another so close.)

Easing the Way

If the bombing were successful, the work of fighter pilots would be simplified. It would also be less dangerous in that they would not be called on to face the concentrated fire of the enemy gunners, but would have the formation already broken up and in such a condition that ordinary fighting tactics could be employed.

There is nothing new in the idea—it was used in a primitive form during the war, before machines were equipped with machine guns—but with the greatly increased striking power of the 20-lb. or 112-lb. bomb in comparison with the jam-tin gunpowder bombs of 1914 and early 1915 there is no reason why the bomber machines should not be used for the purpose of bombing the enemy in the air.

In changing their tactical use there would be no greater "revolution" than that which occurred in 1917 when the first fighter was equipped with a bomb carrier. The great value in this mutation of purpose, providing alternative uses for the same craft, was particularly apparent in 1918 when low-strafing by fighter squadrons greatly accelerated the retreat of the enemy. A similar mutation in the opposite direction may prove of inestimable value in the first few weeks of any future war.

If preparations are to be made so that the dual purpose can be achieved with the same machines there will necessarily have to be some alteration in the training of pilots; but if fighter pilots are given from five to ten hours' training on twin-engined machines there appears to me to be no reason why they should not be employed in flying the bombers on purely defensive flights when the machines were not required for the long-range bombing of enemy objectives.

In raising this question I am not by any means questioning the value of the policy of hitting at the enemy factories, bases and communications, as being the surest means of stopping aerial activity on the part of the enemy. There are many like myself, however, who believe it to be expedient to prepare for a temporary change of tactics so as to meet a possible emergency. If the preparation can be made without detriment to the efficiency of the original tactics, so much the better and, in my opinion, such preparation could be made both economically and expeditiously in the manner I have suggested or by more elaborate means.

Seen as a prototype at last year's Milan show, the military version of the three-engined Cant Z. 506. B. is a low-wing mono-seaplane said to be capable of about 240 m.p.h. (Inset) Mario Stoppani.

ITALY'S MOST RECENT RECORD

Stoppani Again

AN outstanding flight achieved during the last days of 1937 was the long-distance record of Mario Stoppani and his co-pilot, Enrico Comani, who, with wireless operator and mechanic, took off from Cadiz at 1.35 p.m. on December 28 and flew across the South Atlantic to Carvellas, in Brazil, where they landed at 4 p.m. on December 29. The distance covered was about 7,000 km. or 4,350 miles, and the time taken was 26 hours, 25 minutes.

Still to be homologated, this flight will make the eleventh important record established by Italy during 1937. Six of these records were taken by a Savoia Marchetti 79 machine with three Alfa Romeo engines, and were for speeds over distances of 1,000 and 2,000 km., loaded with 500, 1,000, 2,000 and 5,000 kg.

This latest seaplane record was taken on a Cant Z. 506 B low-wing mono-seaplane with three Alfa Romeo 126 R.C. 34 engines, the prototype of which was first seen at this year's Milan Show. The machine is of wooden construction except for the floats, which are duralumin; fully loaded it weighs about 35,450 lb. In its normal military form the Cant Z. 506 B has a disposable load of 8,810 lb., and a maximum speed of 242 m.p.h is claimed.

The new record shows an improvement of 760 miles in distance, and the average speed of 164.5 m.p.h. is about 60 m.p.h. better than that of the previous holder, which was the French Latécoère six-engined flying boat.

Weather conditions were only medium for the flight, and at one time, in mid-ocean, a very bad section was encountered. An altitude between 11,500 and 13,000ft. was maintained for the whole flight, and constant wireless contact was kept with Italian stations and others on the route and in Brazil.

Airspeed Prospects

ACCOUNTING for the disappointing results of the year's trading of Airspeed, Ltd. (a loss of £58,650 was reported), Mr. G. Wigham Richardson, the chairman, explained to shareholders at the annual meeting that, as compared with some old-established aircraft concerns, they had had to go a long way before receiving even a small measure of recognition from the Government in regard to the expansion programme. He also regretted that the sub-contract work which they had been compelled to accept proved unremunerative and accounted for a substantial part of the loss

The policy of the board remained to concentrate as far as possible upon the manufacture of aeroplanes of their own design. They had delivered prototypes of two different aircraft to the Government and had received a large order for one of them, upon which they were actively engaged and of which several units had already gone into service. They were hopeful of receiving shortly further production orders in respect of both these types.

During the year they were honoured with an order for a special Envoy for the use of the Royal Family. Civil Envoys convertible to military purposes had been sold to or ordered by foreign and Colonial governments.

A Chance for Keen Youngsters

SCHOOLBOYS who are thinking of taking up marine engineering are offered a unique chance of studying modern practice in the construction of fast motor craft (such as R.A.F. rescue tenders and target boats) by the British Power Boat Company, of Hythe, Southampton.

Mr. Hubert Scott-Paine has arranged to take a number of youngsters for a summer vacation course at his works. Those accepted will be paid a nominal wage.

Boys interested should apply as soon as possible, giving the dates between which they desire to take the course and stating briefly the type of experience wanted.

ALL ABOUT AIRPORTS

ALTHOUGH no Airports Exhibition is being held this year by the Aerodrome Owners' Association, the Airports Conference will take place as usual, and delegates from all over the country will come to London to hear papers read by experts on various aspects of the subject.

The Conference takes place on January 19–21, and co-incidentally with it, on Thursday, January 20, "Flight" will publish its Annual AIRPORTS NUMBER. This considerably enlarged Special Number will in many ways fill the gap created by the absence of an Exhibition, for the latest developments in airport construction, operation and maintenance will be discussed in detail.

Specialists will deal with particular aspects, Manufacturers' new Equipment will be described, and there will be a graphic, fully illustrated review of the world's leading airports.

TO-DAY FORTNIGHT FLIGHT JANUARY 20

SERVICE AVIATION

Royal Air Force and Official Announcements : Fleet Air Arm News : Military Aviation Abroad

LORD HUNTINGFORD, Governor of Victoria, in an Anson of the City of Melbourne Squadron, of which he is the Honorary Air Commodore.

Director of Medical Services

AIR Commodore Albert Victor John Richardson, C.B., O.B.E., M.B., B.Ch., D.P.H., K.H.S., is appointed Director of Royal Air Force Medical Services, Air Ministry, on March 1, *vice* Air Vice-Marshal Sir Alfred W. Iredell, K.B.E., C.B., M.R.C.S., L.R.C.P., K.H.P., who retires on that date.

Air Comdre. A. V. J. Richardson was commissioned in the Royal Navy as a Surgeon in 1908, and in 1914 attained the rank of Surgeon Lieutenant-Commander. In October, 1918, he became a temporary Major in the Medical Branch of the Royal Air Force, and in the following August was granted a permanent commission with the rank of Wing Commander. During the Great War Air Comdre. Richardson served in France with the Royal Naval Air Service, and for his distinguished services received the O.B.E. Since July, 1936, he has been Principal Medical Officer at Headquarters, Bomber Command. He received the C.B. in the Birthday Honours List, 1937. He was promoted to Group Captain in 1927, and to his present rank in 1934, and since March, 1935, has been Honorary Surgeon to the King.

New Air Vice-Marshals

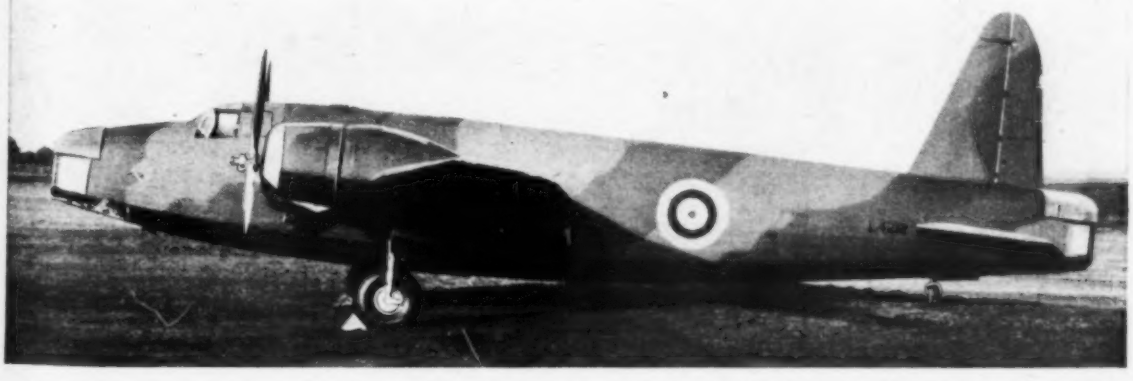
THE following are brief accounts of the careers of the four new Air Vice-Marshals who were promoted to that rank on January 1:—

Air Commodore J. S. T. Bradley was first appointed to a commission in the Army in 1914 and in August, 1918, was specially employed in the R.A.F. with the temporary rank of Lieutenant-Colonel. In September, 1919, he was granted a permanent commission in the Royal Air Force and afterwards was employed at Headquarters, Inland Area, until given command of No. 14 Squadron in December, 1921. From January, 1924, until November, 1925, Air Comdre. Bradley was in Iraq. He was appointed to Headquarters, A.D.G.B., in March, 1926, and was promoted to Wing Commander in the following July. He commanded Station Headquarters, Northolt, between March, 1930, and January, 1931, and was promoted to Group Captain in July, 1931. He attended a course at the Imperial Defence College throughout 1934. Since January, 1935, he has held the appointment of Director of Equipment at the Air Ministry, and was promoted to the rank of Air Commodore in July, 1935. For his services during the war he was awarded the O.B.E.

Air Commodore W. S. Douglas entered the Army from Oxford University in 1914 and, whilst serving in France, was attached to the R.F.C. in January, 1915. He graduated as a pilot the following July and later commanded Nos. 43 and 84 Squadrons in France. He was awarded the M.C. and D.F.C., and was mentioned in despatches on three occasions. After graduating at the Royal Air Force Staff College, he was appointed, in 1924, to the Air Ministry for Air Staff duties, and was promoted to Wing Commander in January, 1925. Throughout 1927 he attended a course at the Imperial Defence College. He was at Headquarters, Middle East, from August, 1929, to March, 1932, and was appointed instructor at the Imperial Defence College in July, 1932. He was promoted to Group Captain in January, 1932, and to Air Commodore in July, 1935.

Air Commodore Tyssen was mobilised at the outbreak of war whilst serving in the Territorial Force and seconded while serving in France to the R.F.C. as a Flying Officer in 1915. During the Great War he served with No. 22 Squadron and commanded No. 58 Squadron in France and was awarded the Military Cross for conspicuous skill and gallantry. In 1920 he was appointed to command No. 20 Squadron in India. He was promoted to Wing Commander in January, 1923, and in 1934 was posted to No. 1 Group Headquarters. He was appointed Senior Air Force Officer in H.M.S. *Argus* in September, 1928. He commanded the R.A.F. Base at Gosport from April, 1930, to March, 1935, following which he was employed at Fighting Area Headquarters and subsequently at No. 11 (Fighter) Group. He was promoted to Group Captain in 1931 and to Air Commodore in 1935. He was appointed A.O.C. (temporary) of No. 12 (Fighter) Group in April, 1937, and, since November, 1937, he has been employed at H.Q., Iraq.

Air Commodore D. C. S. Evill entered the Royal Navy as a Sub-Lieutenant in May, 1913. Having already obtained his R.A.C. certificate he was appointed to the Royal Naval Air Service as an Acting Flight Lieutenant in 1914. From February, 1915, to June, 1917, he was stationed at Dunkirk and actively engaged on flying duties. He was awarded the D.S.C. and A.F.C. for his services, and was mentioned in despatches in January, 1919. Following his promotion to Wing Commander in January, 1925, he was engaged on instructional duties at the R.A.F. Staff College, and held the appoint-



GEODETIC "TWIN": The production-type Vickers Wellington I (two Pegasus XVII) built, like the Wellesley, on the geodetic principle. Part of the construction can be glimpsed through the Perspex of the bomb-aimer's window.

Service Aviation

SO FAR, SO GOOD : The five London flying boats of No. 204 (G.R.) Squadron on the River Hughli below Calcutta. They are on a cruise to Australia.

ment of Assistant Commandant of the R.A.F. College, Cranwell, from 1929 to 1931. He was promoted to Group Captain in 1932, and throughout 1933 attended a course at the Imperial Defence College. From January, 1934, to September, 1936, he served as a Deputy Director in the Air Ministry. He was promoted to Air Commodore in January, 1936.

The Production Wellington

PHOTOGRAPHS are published in this issue of the production model Vickers Wellington Mark I. Machines of this type, together with Bristol Blenheims (already in service) and Handley Page Hampdens (now well into production) will go to build up a strong striking force of fast twin-engined medium bombers—a feature greatly to be desired in any truly modern air arm.

The prototype Wellington was present at the R.A.F. Display in 1936. Second of the Vickers series to be built on the geodetic principle, it stimulated great technical interest not only on that account, but due likewise to its fine lines and ingenious tail and nose gun turrets which, however, as exhibited, were only temporary structures. The production machine, while retaining the same deep oval-section fuselage of the original model exhibits a number of improvements. Both nose and tail are comparatively square-cut and appear to be planned for the installation of Nash and Thompson multi-gun turrets. There is still a disappearing mounting on top of the fuselage. The rear section of the fuselage is of deeper cross section; the retractable undercarriage has been re-designed; the tail wheel now retracts; special Vickers "dishpan" cowlings with cooling louvres reminiscent of those on American radials of a few years back and Canadian installations of to-day are incorporated; and the vertical tail surfaces have been revised.

Bristol Pegasus XVII radials with two-speed superchargers are specified to power the Wellington I. This type of engine gives 900 h.p. (max.) at 17,750ft. and 980 h.p. for take-off.

Dimensions of the Wellington I are 86ft. 11in., length 61ft., and height 18ft. 6in.

Deflection

A MOST disturbing bugbear which confronted armament technicians as the speed of military aircraft rose above 200 m.p.h. —the problem of training free guns—has been routed by the introduction of some ingenious power-driven gun turrets as typified by the Nash and Thompson models specified for some of the latest British machines. But life is far from easy for the ballisticians, who are now confronted with what threatens to become an even more formidable obstacle—the deflection of bullets fired at an angle to the line of flight.

On the Continent the problem came into prominence during firing trials from the French *multiplace de combat* machines at Cazaux, the proving ground of French aircraft. It was discovered that, although some most impressive arcs of fire were obtainable on paper, the deflection of bullets fired broadside detracted very seriously from their fighting value.

The logical step to take against this phenomenon is to increase the muzzle velocity of the bullets. This could be achieved by lengthening the gun barrel or increasing the propulsive charge, both of which measures have obvious limitations.

The large orders which have been placed for power-driven turrets in this country might indicate that *l'effet de Cazaux* might not be so serious where small-bore, high-velocity guns are concerned, as is extensively believed, but, whatever the true facts, it seems that deflection of bullets and shells may be a prominent factor in determining the value of multi-seater fighters with free armament.

Royal Air Force Gazette

Royal Air Force

General Duties Branch

The following Flying Officers are promoted to the rank of Flight Lieutenant (December 6):—F. C. Richardson, N. de W. Boult, W. A. Theed.

Lt. Cdr. L. G. Richardson, R.N., Sqn. Ldr., R.A.F., ceases to be attached to the R.A.F. on return to Naval duty (December 13); Capt. B. W. de Courcy-Ireland, R.M., Flt. Lt., R.A.F., ceases to be attached to the R.A.F. on return to duty with the Royal Marines (October 1).

Chaplains Branch

The Rev. G. W. N. Groves, A.L.C.D., is granted a permanent commission (November 1); the Rev. T. D. Barr is granted a short service commission with the relative rank of Squadron Leader, with effect from December 14.

MORE SQUADRON BADGES : Some further designs approved by His Majesty the King. Others appear on the next page. Chester Herald's descriptions are as follows : No. 11 (Bomber) Squadron : Two eagles volant in pale. No. 13 (Army Co-operation) Squadron : In front of a dagger a lynx's head affrontee. No. 14 (Bomber) Squadron : A winged plate charged with a cross throughout and surmounted by the head and shoulder pieces of a suit of armour. No. 20 (Army Co-operation) Squadron : In front of a rising sun an eagle, wings elevated, perched on a sword.

Royal Air Force Volunteer Reserve

Medical Branch

The following are granted commissions as Flight Lieutenants with effect from December 28:—G. M. Rose, L.R.C.P. and S., L.D.S.; H. F. Squire, M.R.C.S., L.R.C.P.

Auxiliary Air Force

General Duties Branch

No. 504 (COUNTY OF NOTTINGHAM) (B.) SQUADRON.—Lord Mottistone, P.C., C.B., C.M.G., D.S.O., is appointed Honorary Air Commodore (December 13).

Half-Yearly Promotions

With effect from January 1, 1938:—

General Duties Branch

Air Commodores to be Air Vice-Marshals.—J. S. T. Bradley, O.B.E., W. S. Douglas, M.C., D.F.C., J. H. S. Tyssen, M.C.; D. C. S. Evill, D.S.C., A.F.C. *Group Captains to be Air Commodores*: R. P. Willock, F. G. D'Hards, D.S.C., D.F.C., W. A. McClaughry, D.S.O., M.C., D.F.C. (Acting Air Commodore), A. A. B. Thomson, M.C., A.F.C. *Wing Commanders to be Group Captains*: F. H. Coleman, D.S.O., K. M. St. C. G. Leask, M.C., H. W. G. J. Penderel, M.C., A.F.C., C. N. Lowe, M.C., D.F.C., R. H. M. S. Saundby, M.C., D.F.C., A.F.C. (Acting Group Captain), A. W. Mylne, J. K. Summers, M.C., E. L. Howard-Williams, M.C., J. W. Woodhouse, D.S.O., M.C., J. L. Vachell, M.C. (Acting Group Captain), D. F. Stevenson, O.B.E., D.S.O., M.C., G. E. Livock, D.F.C., A.F.C.

Squadron Leaders to be Wing Commanders.—B. B. Caswell, F. J. Fogarty, D.F.C., A.F.C., E. P. Mackay (Acting Wing Commander), J. C. Foden, A.F.C., J. Bussey, O. E. Carter, A.F.C., S. E. Storrar, H. S. Broughall, M.C., D.F.C., S. D. Macdonald, D.F.C. (Acting Wing Commander), V. S. Parker, D.F.C., A.F.C., T. M. Williams, M.C., D.F.C., C. P. Brown, D.F.C., V. E. Groom, D.F.C., F. Wright, W. J. Seward, J. A. Gray, D.F.C., F. Beaumont (Acting Wing Commander), G. S. Shaw, J. McFarlane, M.C., A.F.C., R. L. McK. Barbour, D.F.C., A.F.C., R. J. Rodwell, C. E. Williamson-Jones, D.F.C., N. L. Desoer, J. Blackford, J. T. Paine, E. J. Kingston-McCloughry, D.S.O., D.F.C., F. W. H. Clarke (Cdr., R.N.), C. B. Tidd (Cdr., R.N.), M. S. Slattery (Cdr., R.N.).

Flight Lieutenants to be Squadron Leaders.—J. G. Western, B.B.E., I. Hodgson, G. Lacey, J. F. Tadman, C.G.M., and Lt. Cdrs., R.N., H. H. Caddy, R. A. Kilroy, J. B. Buckley, J. P. G. Bryant, P. W. Humphreys, and O. S. Stevinson.

Flying Officers to be Flight Lieutenants.—R. T. Partridge (Capt., R.M.), W. H. C. Manson (Lt., R.M.), and Lts. R.N. J. L. Hallewell, E. H. G. Stokes, E. R. C. Morris, C. E. H. Batham, G. S. Lamb, G. A. L. Woods, N. K. Campbell, P. C. Carew, R. J. H. Stephens, J. M. Bruen.

Equipment Branch

Wing Commanders to be Group Captains.—W. J. Shields. *Squadron Leaders to be Wing Commanders*: W. A. Kingston, W. G. MacD. Nicholl, J. K. McDonald, W. A. O. Honey, T. S. James, A. G. Knight, M.B.E., R. A. Young, H. E. Tansley, M.C., R. F. Osborne, F. H. Sims.

Accountant Branch

Squadron Leaders to be Wing Commanders.—F. W. Arthurton, K. R. Money, O.B.E., P. Hay, M.C., W. R. Westcombe, C. W. Rogers.

Medical Branch

Wing Commanders to be Group Captains.—J. Kyle, M.R.C.S., L.R.C.P., A. F. Rook, O.B.E., M.R.C.P., M.R.C.S., D.P.H. *Squadron Leaders to be Wing Commanders*: R. L. C. Fisher, M.B., B.Ch., D.O.M.S., G. J. Hanly, M.B., Ch.B., F.R.C.S. (E.), J. Parry-Evans, M.R.C.S., L.R.C.P., D.L.O., A. A. Townsend, M.B., B.Ch.

FOREIGN SERVICE NEWS

Small but Good

A BRIEF note appeared on this page last week regarding the finances of the Turkish Air Force, which, though small (possessing, probably, about 200 machines), is being equipped with some advanced aircraft. Prominent among the fighting equipment are forty Polish-built P.Z.L. P24 gull-wing single-seaters (Gnome Rhone K. 14), which may be armed with two "cannons" and two machine guns or with four machine guns.

The bombing force is being brought up to date with such formidable material as Bristol Blenheims, Vultee V-11s, Martin 139-Ws, and Heinkel He.111s.

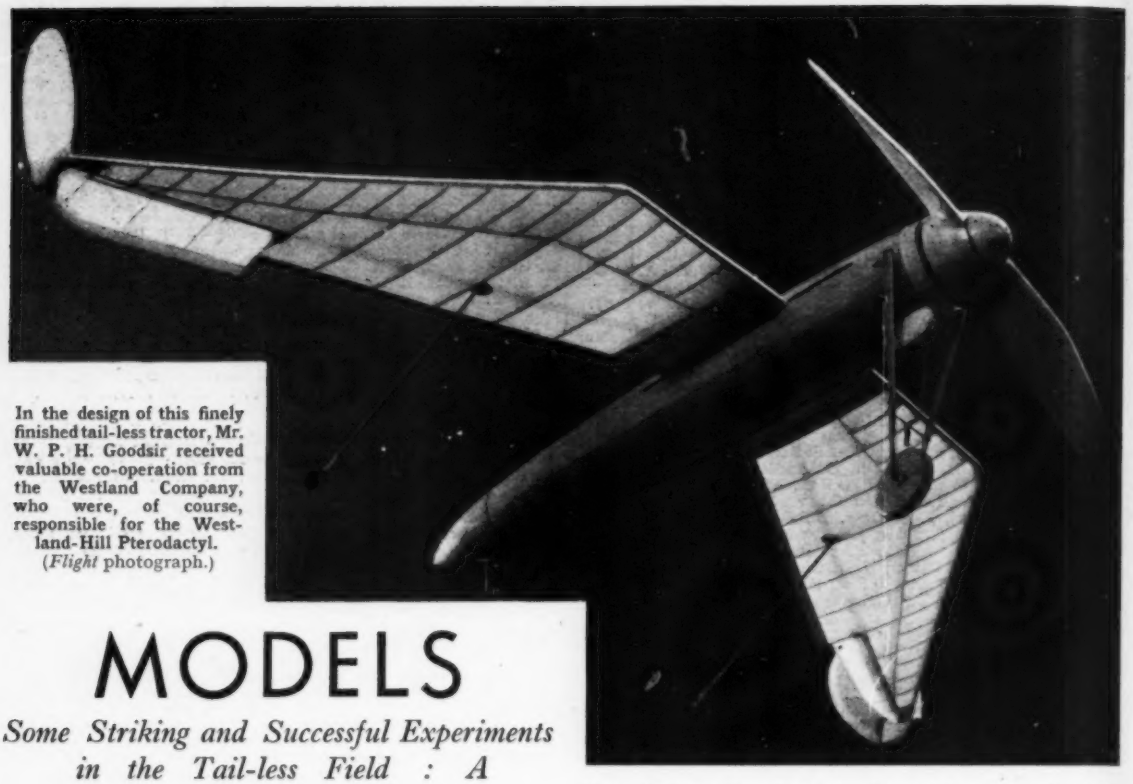
A Long-range Fighter

COLONEL ALEXANDER P. DE SEVERSKY, who recently flew a single-seater fighter of his own manufacture non-stop from New York to Havana (1,350 miles) prior to demonstrating the machine in Latin-American countries, is arranging the trip as a practical demonstration of the potentialities of the P-35 as a long-range machine. The first leg will be from New York to Mexico City, a distance of 2,350 miles. From Mexico City, Colonel Seversky intends to make a non-stop flight to Panama (1,500 miles), then to Lima, Peru (1,800 miles), then non-stop to Buenos Aires, a distance of 2,100 miles. These long non-stop flights, it is claimed, are possible only in a Seversky pursuit (or fighter) machine, because it is the only one in the world with fuel capacity as standard equipment sufficient to fly more than 3,000 miles non-stop.

Colonel Seversky has always been a strong advocate of the necessity of designing pursuit aircraft for long-range work. In discussing this, he stated that the advantages of long-range capacity in these types were three-fold in point of view of American defence: First, in order adequately to convoy bombers they should have a range equal to that of bombers; secondly, in case of invasion, they should have the ability to be concentrated rapidly for interception against attack in any point of the United States or its possessions, without the necessity of refuelling en route; thirdly, for flexibility and mobility of operation, it was important that they should have the ability to move to distant points under their own power and be independent of other forms of transport. It is now necessary to transport single-seater fighters by steamer to American possessions in the Pacific, which is slow, cumbersome and ineffective, particularly in the event of national emergency. With the fuel capacity of the P.35, all America's fighters could be concentrated overnight at any point in the United States or its colonies.

The long-range qualities of the Seversky pursuit are made possible by a novel patented structure which makes use of the entire wing cavity, without tanks, for petrol storage.

MORE SQUADRON BADGES: No. 23 (Fighter) Squadron (right): An eagle preying on a falcon. No. 24 (Communications) Squadron: A black cock. No. 31 (Army Co-operation) Squadron: In front of a wreath of laurel a mullet. No. 500 (County of Kent) (Bomber) Squadron: A horse forcene. No. 602 (City of Glasgow) (Bomber) Squadron: In front of a Saltire a lion rampant.



In the design of this finely finished tail-less tractor, Mr. W. P. H. Goodsir received valuable co-operation from the Westland Company, who were, of course, responsible for the Westland-Hill Pterodactyl. (*Flight* photograph.)

MODELS

Some Striking and Successful Experiments in the Tail-less Field : A Tractor and a Pusher

By M. R. KNIGHT

Tail-less Models

SEVERAL years ago *Flight* described a tail-less model with which Mr. F. B. Baggs established the still existing type record of 90 sec. Recently the writer has encountered two further examples of this extremely rare species, both very successful, yet differing in almost every other respect.

But for unforeseen delay in completion one of them would have competed in the Wakefield Trials, incidentally, under a disadvantage, as the wing area is there limited to 210 sq. in., and a Pterodactyl requires at least 25 per cent. more area than the conventional type to make good the loss of lift through the upward deflection of the controllers. Confirmation is offered by Westland Aircraft, Ltd., who afforded valuable assistance to Mr. W. P. H. Goodsir, the constructor of the model shown at the top of this page. They put forward the interesting suggestion that both types could compete on even terms if the combined area of wing and tail was specified, and the individual designer left to apportion the respective sizes.

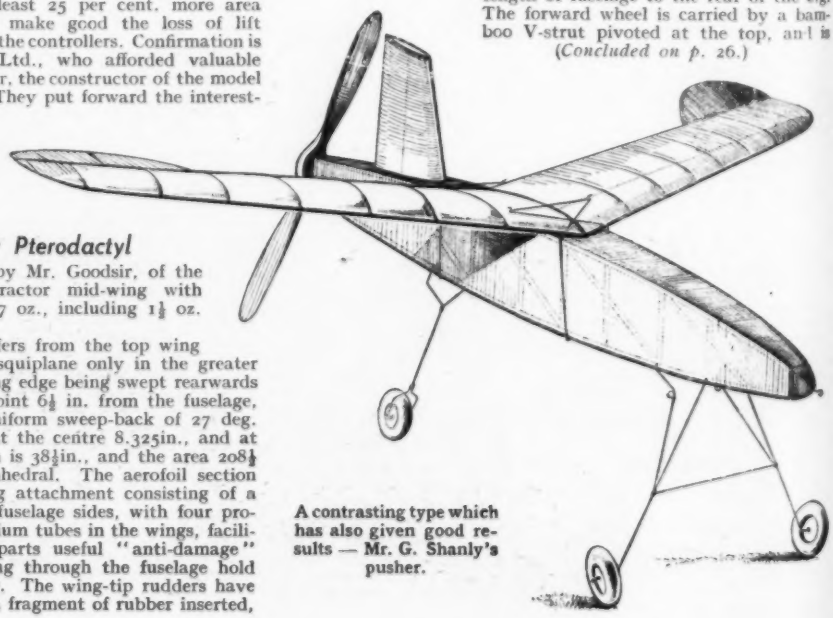
The Goodsir Tractor Pterodactyl

THE tail-less model designed by Mr. Goodsir, of the Croydon D.M.A.C., is a tractor mid-wing with monocoque fuselage. It weighs 7 oz., including 1½ oz. of rubber.

The plan-form of the wing differs from the top wing of the Westland-Hill Mark V sesquiplane only in the greater amount of sweep-back, the leading edge being swept rearwards at an angle of 47 deg. from a point 6¼ in. from the fuselage, while the trailing edge has a uniform sweep-back of 27 deg. At the roots the chord is 5in., at the centre 8.325in., and at the tips 1½in. The tip-to-tip span is 38½in., and the area 208½ sq. in. There is 1 degree of anhedral. The aerofoil section is R.A.F.34. An ingenious wing attachment consisting of a carrier sliding in grooves in the fuselage sides, with four projecting pegs plugging into aluminium tubes in the wings, facilitates longitudinal trim, and imparts useful "anti-damage" properties. Rubber bands passing through the fuselage hold the wing halves securely together. The wing-tip rudders have their lancewood pivots split and a fragment of rubber inserted, thus ensuring a firm fit in aluminium tubes in the tip stubs. The hinged controllers, the rudders and the wings themselves are covered with Japanese tissue proofed with banana oil.

The circular-section fuselage has a diameter of 3½in., and consists of balsa plywood formers planked with $\frac{1}{16}$in. balsa sheet, sandpapered, treated with banana oil and french-polished. The nose and tail plugs are attached by means of press studs. The airscrew, 14in. in diameter and 20½in. in pitch, is turned by a 14-strand skein of $\frac{3}{16}$in. rubber. Concealed in the airscrew boss is a free-wheel device, also a tensioner, which prevents the rubber whipping about, settling unevenly and thus upsetting the longitudinal trim. This is important in such a model, which is inclined to be sensitive longitudinally owing to the inertia of the considerable length of fuselage to the rear of the c.g. The forward wheel is carried by a bamboo V-strut pivoted at the top, and is

(*Concluded on p. 26.*)



A contrasting type which has also given good results — Mr. G. Shanly's pusher.

THE INDUSTRY

SHADOWLESS SHADOW FACTORY: The gauge-room of a Government aircraft factory, illuminated by G.E.C. "Osira" fluorescent-tube lighting. Originally developed for decorative illumination, this system has been found most valuable for industrial purposes, especially in examples of this kind, where high intensity coupled with great diffusion is required, and where, owing to the delicacy of the instruments, there must be no local heating from the lighting apparatus. In the installation shown here, a combination of pink and bluey-white tubes effectively provides light approximating in quality to sunlight—an important psychological consideration in a room which, owing to atmospheric requirements, has no windows.

D.H.'s Divisional Diversion

THAT Great Britain is lagging sadly behind in preparing for the very intense competition on the Atlantic air routes which is about to start was the considered opinion expressed by Capt. A. S. Wilcockson, the well-known Imperial Airways pilot, at the annual dinner of the De Havilland engine and airscrew divisions last Saturday. Capt. Wilcockson was responding to the toast of the guests, and had entertained his audience with some brief impressions of his Atlantic flights in *Caledonia*.

For the machine and engines he had nothing but praise. In spite of being loaded to a gross weight of 45,000 lb. for the Atlantic flights the boat never took more than 30 seconds to "unstick," even when conditions were unfavourable. Without the De Havilland controllable-pitch airscrews that would not have been possible. He referred to the experimental flights which are to be made during the present year and expressed the hope that at next year's dinner Mr. Butler would be able to announce the success of the Albatross.

On last year's experimental flights they had had wonderful assistance not only from the radio stations at Foynes and Botwood, but also from shipping. This year he hoped that that assistance would be expanded.

The Atlantic, Capt. Wilcockson said, offered wonderful possibilities, and in the future there would be a vast volume of traffic across it by air. Unfortunately, we in this country had allowed ourselves to lag behind America, France and Germany, and he considered that we were about three years behind them in such things as the training of crews, and in the matter of instruments and equipment. It was absolutely essential that more money should be forthcoming in order that our aircraft constructors might have a chance to keep abreast of foreign competition. Unless we did, we should not achieve the same position in the air as we had attained on the sea. He sincerely hoped that we should get the necessary means, even as a result of the enquiry now being held.

Mr. A. S. Butler, chairman of the De Havilland Aircraft Co., Ltd., in explaining why it had been thought necessary this year to split the annual dinner into two, one for the airscrew and engine divisions and one, to be held on January 15, for the aircraft division, pointed out that the firm had grown enormously during the year, some 4,200 people being now employed at Hatfield and Stag Lane. Of flight successes achieved during 1937 Mr. Butler recalled particularly Miss Jean Batten's Australia-England, and Clouston's London-Cape-London. The aircraft division, he recalled, had produced the Albatross, the 94, the Don and the T.K.4 ; the airscrew division had completed one year's working as a unit and had produced the world's largest and smallest controllable-pitch airscrews. To the engine division went the credit of having produced the most powerful D.H. engine to date, the Gipsy Twelve.

The De Havilland schools at Hatfield and Maidenhead had contributed to the firm's success, and the overseas companies, from whom he read cablegrams, had also had a successful year. His announcement that the holidays-with-pay scheme had now been adopted was greeted with applause.

Mr. Laurence H. Pomeroy, in proposing the toast of the guests, made a speech full of witty quips and references, which, however, were purely aimed at "family affairs."

N.A.E.P. Go Ahead

NO newly formed company could hope to make greater progress in the course of sixteen months than have Northern Aircraft and Engineering Products, Ltd., of Knott Mill, Manchester, 15. The youthful enthusiasm (yet coupled with considerable experience) of Mr. J. D. R. Kay, and the sound works knowledge of Mr. A. Gartside, to mention two directors, are, no doubt, responsible for the "go-ahead" nature of the firm.

Large orders, mainly for aircraft components, are being executed in the various departments. Engine cowlings for a dozen A.W. Ensigns were completed some time ago, and, at

At the D.H. top table : From left to right, Major Frank B. Halford, the famous designer of the Gipsy engines ; Mr. F. T. Hearle, General Manager ; Capt. A. S. Wilcockson of Imperial Airways ; Capt. Geoffrey de Havilland ; Mr. A. S. Butler, chairman of the company ; Capt. C. C. Walker, chief engineer ; and Mr. T. P. Mills, a director.

the present time, cowlings for Cheetah installations are going through. All these have the neat double-grip type fastener. The spinnings for these cowling orders, of which more will soon be commenced, are supplied by the Manchester Tinning Co., of Brookside Works, Manchester, 9.

Apart from numerous small parts, auxiliary tanks and instrument panels are being produced for famous medium bombers, and port and starboard sectioned leading edges are made up back-to-back on a special jig. A large order for bomb cell doors is in hand.

One or two products not *quite* so directly connected with the aircraft industry are also manufactured by Northern Aircraft, notably non-seizable cocks for such liquids as beer, brine and syrup; and refrigerators for special duties.

Rolls-Royce Board Appointment

MR. HARALD PEAKE, M.A., has been appointed to fill the vacancy created on the Rolls-Royce Board by the death of Major-General Sir Wm. G. Bertram Boyce.

Mr. Harald Peake is joint managing director of Airedale Collieries, Ltd., and other colliery companies.

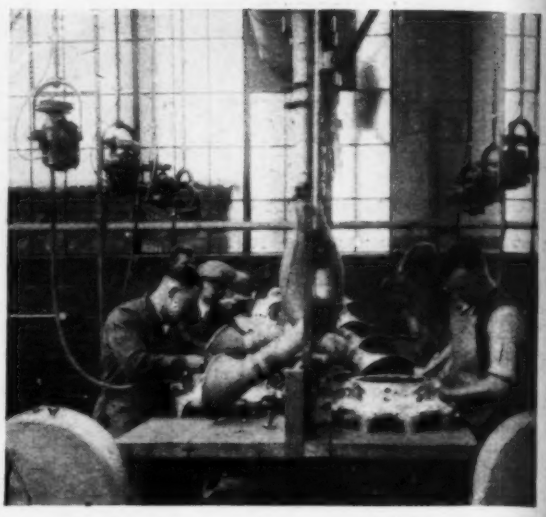
He was educated at Eton and Trinity College, Cambridge, served in the Coldstream Guards in the European War, and has a very practical interest in aviation, for he is a Squadron Leader in the Auxiliary Air Force.

Jicwood Limited

IN *Flight* of December 9, 1937, it was announced that a new company was about to be formed under the title of Jicwood, Ltd. Further particulars of the new concern, which is a subsidiary of The Airscrew Co., Ltd., of Weybridge, and Halila, Ltd., of Bush House, London, are now available. The nominal capital of £36,000 was taken up between the Airscrew Co. and Halila, and the board will consist of Mr. J. D. Titler (chairman), Dr. H. C. Watts, Mr. R. Bradfield and Mr. F. T. Swann. Mr. Swann, who is a director of Halila, Ltd., recently joined the board of The Airscrew Co., Ltd.

The new company has been formed to produce commercial and aircraft plywoods and special waterproof and high-strength plywood for stabilised wing coverings. The company will also develop wood improved by compression and impregnation with thermo-setting materials, as well as the Halila double-curvature process.

Jicwood, Ltd., will take over the manufacture of the Samsonow compressed wood used in the manufacture of airscrew blades, with which the Airscrew Company has had considerable success, such blades having totalled some 12,000 flying hours in the R.A.F.



THE NEAT WAY: An overhead installation of "Morrisflex" grinders being used for crankcase finishing in a shadow factory. These flexible-shaft tools—which, of course, are adaptable to many other duties, such as buffing and drilling, are made by B. O. Morris, A.M.I.Mech.E., Tythe Barn Lane, Shirley, Birmingham.

In addition to the other products mentioned it is the intention that Jicwood, Ltd., shall produce high-strength spars of compressed wood, either of constant density or of variable density, using both the Samsonow interleaving patent and the Jicwood cement patents. The general management of Jicwood, Ltd., is under the direction of Mr. J. D. Titler and Mr. F. T. Swann. Dr. Watts will act as technical adviser and Capt. Hubert Broad is looking after the liaison with the aircraft industry. The secretary of Jicwood, Ltd., is Mr. E. R. Mainwaring, and the offices and works of the company are at Weybridge, Surrey.

MODELS

(*Continued from page 24.*)

sprung by a central 14-gauge wire with shock-damper consisting of rubber tube over the lower end of the wire. A bamboo strut, carrying a tiny wheel, plugs into a paper tube fixed to a reinforced rib in each wing. The overall length of the model is 24in.

At the roots the incidence is neutral, while the tips have a negative angle of 4½ deg. There are 1½ deg. of down-thrust, the thrust-line being on the centre-of resistance and slightly below the c.g. The machine is rock-steady in flight and has a flat glide, while, despite the low power, it has an excellent climb and is fast. The longest duration to date, made under wintry conditions, has been 49 sec. Left and right turns and straight flights are easily obtained, up or down wind, by means of the controllers.

The Shanly Tail-less Pusher

MR. G. SHANLY'S tail-less model is of the pusher type, and is a high-wing monoplane with a moderate amount of taper. The wing is in two parts, joined at the centre by two birch dowels in one section, plugging into cartridge-paper tubes in the other, the completed wing being coupled to the top of the fuselage with rubber bands. The span of each wing section is 18in., the chord tapering from 5in. to 3½in. On the leading edge there is a uniform sweep-back of 25 deg., and on the trailing edge 20 deg. The section is Clark Y, with ¼in. washout. Controllers 5½in. long and 2¼in. wide are hinged to a reinforced section of the trailing edge by means of small pieces of aluminium sheet and are set at a considerable negative angle. Unlike the Goodsir model, the wing has a slight dihedral angle.

Four longerons of $\frac{3}{32}$in. × $\frac{3}{32}$in. balsa, with cross-struts and sundry diagonal members, form the rectangular-section fuselage, which is 20½in. long, 2in. wide, and 2¼in. deep. The first and last bays are reinforced with $\frac{1}{16}$in. sheet. The undercarriage has a wheelbase of 5½in., and comprises a pair of 1¼in. celluloid wheels carried by two 20-gauge wire struts, with 24-gauge rear legs incorporating the popular "safety-pin" loops. It is completely detachable from the fuselage, as is the 20-gauge wire holding the rear wheel.

An airscrew 12in. in diameter and 12in. in pitch, is powered by a 6-strand skein of ¼in. flat rubber. There are about 3 degrees of down-thrust. A free-wheel device is employed, also a rubber-tensioner, which can be adjusted on the field to suit the pull of different motors. In place of wing-tip rudders there is a single removable fin, 4in. wide and 4½in. high, mounted on the fuselage just ahead of the airscrew. The fuselage is covered with bamboo paper, and the wings and fin with Japanese tissue.

Stability, climb, glide and duration are all very satisfactory.

S.M.A.E. Contests

THE 1938 outdoor season of the Society of Model Aeronautical Engineers opens on April 3. Early notice of the April and May fixtures will doubtless be welcomed. Those marked with an asterisk (*) are decentralised contests, held simultaneously on the grounds of affiliated clubs.

April 3, Gamage Cup, any rubber-driven type, average of three rise-off-ground flights*; April 17, Pilcher Cup, Wakefield types, average of three r.o.g. flights*; May 8, *Model Engineer* Cup No. 1, gliders, rules as 1937*; May 22, Seaplane contest, use of launching-tank optional*; May 29, *Flight* Cup, speed, rules as 1937, ground to be announced.

* * *

The new catalogue of Kanga Aero Models, 1, Colonnade Passage, New Street, Birmingham, covers a comprehensive range of models, engines, materials and accessories. Kits are obtainable for several successful Bowden petrol-planes, including the Kub (1937 Shelley Cup winner), Kite (scaled-up Kub), and Blue Dragon (one-time British record-holder). Engines range from the 2.3 c.c. Spitfire to the 18 c.c. Comet, and include the new Challenger and Ohlsson. Engine mountings and automatic flight-timers are also listed.